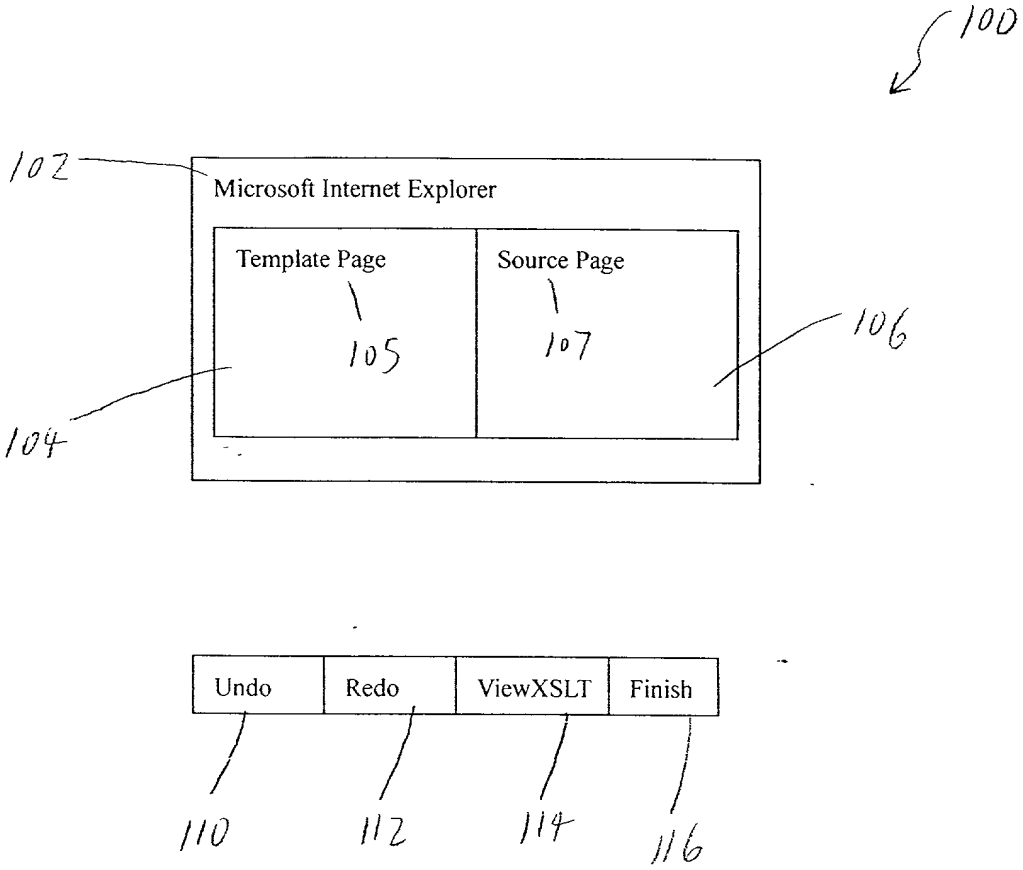

100
102
Microsoft Internet Explorer
Template Page
105
Source Page
107
106
104
Undo
Redo
ViewXSLT
Finish
110
112
114
116

Fig. 1

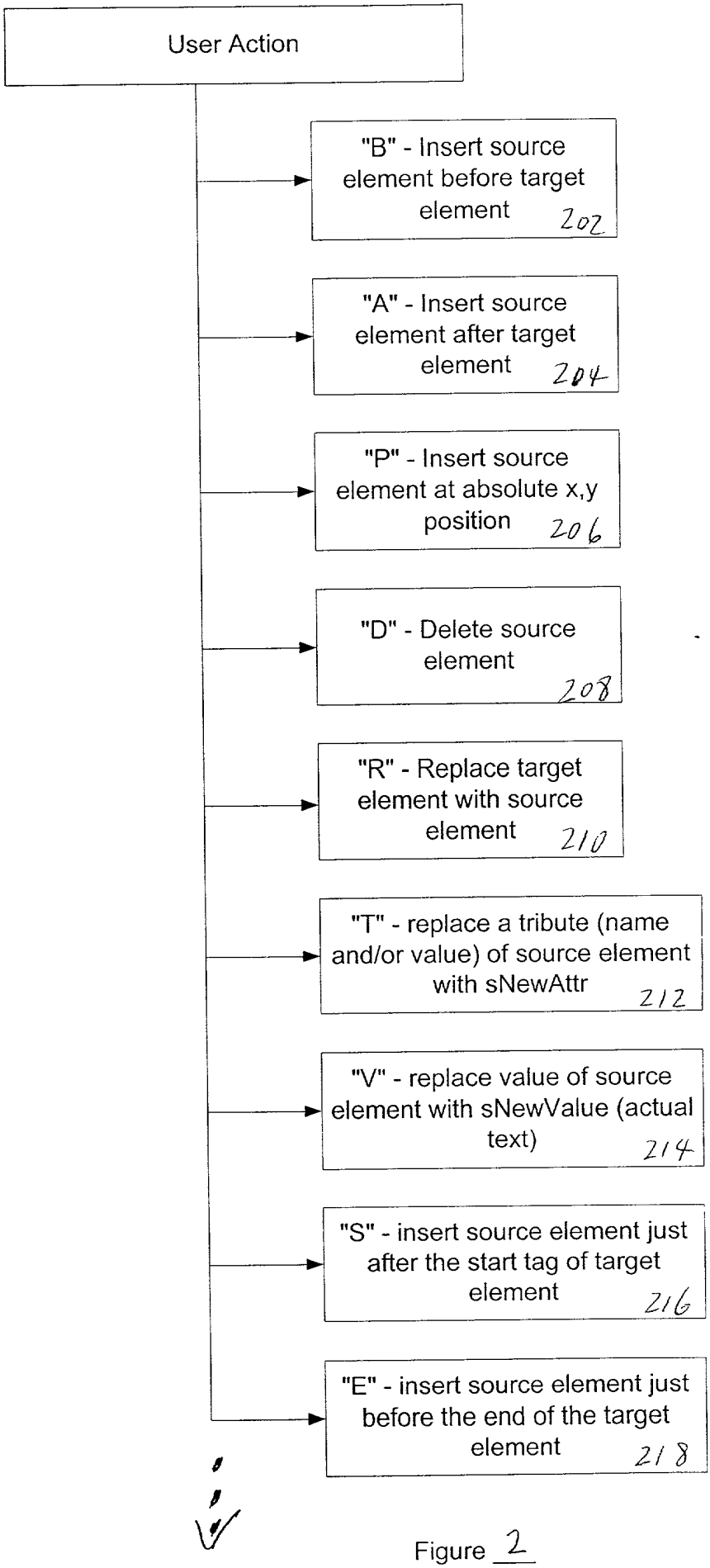

User Action
200
"B" - Insert source element before target element
202
"A" - Insert source element after target element
204
"P" - Insert source element at absolute x,y position
206
"D" - Delete source element
208
"R" - Replace target element with source element
210
"T" - replace a tribute (name and/or value) of source element with sNewAttr
212
"V" - replace value of source element with sNewValue (actual text)
214
"S" - insert source element just after the start tag of target element
216
"E" - insert source element just before the end of the target element
218

Figure 2

Generate XSLT

300

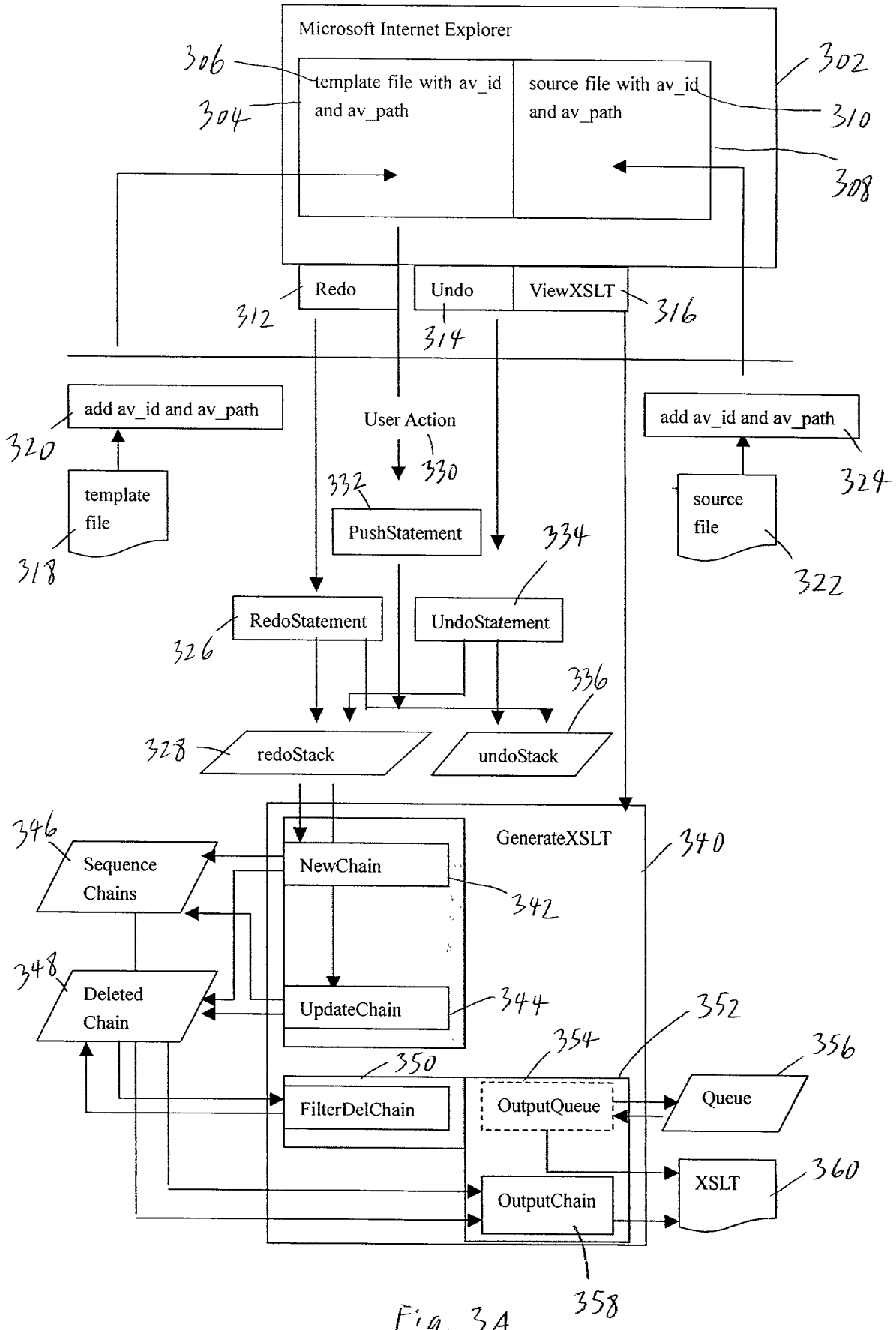


Fig. 3A

2

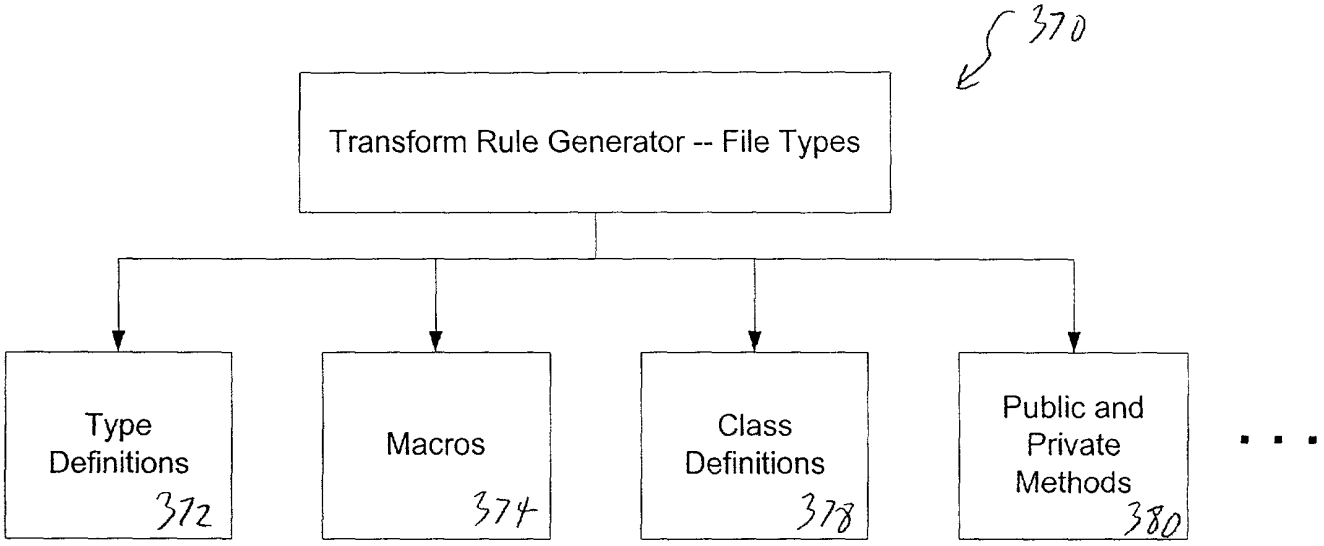


Figure 3B

TagId

```
typedef struct _TagId{
    int         iPage;      // page /deck number
    int         iCard;      // card number for WML only
    int         iFamilyId;
    DOMString   sFrame;  //sample: i1.3.2
    DOMString   sNewTag;
    DOMString   sId;
    DOMString   sName;
    DOMString   sPath; //sample: tmp/html[1]/body[1]
    DOMString   sAbsPos;
    bool        bIsChanged;
    bool        bIsAbsPosOrg;
    char        cAbsPos;
    int         x, y;
}TagId;
```

Fig. 4A

Statement

```
typedef struct _Statement{
    bool        bNewAction;
    char        cAction;
    struct _TagId  sourceEle;
    struct _TagId  targetEle;
    DOMString   *psNewAttrName;
    DOMString   *psNewAttrValue;
    int         iNumOfAttr;
    DOMString   sNewText;
    struct _Statement *pPrev;
    struct _Statement *pNext;
}Statement;
```

Fig. 4B

Stack

```
typedef struct _Stack{
    Statement   *pFirstStatement,
    Statement   *pLastStatement; } Stack
```

Fig. 4C

Element

```
typedef struct _Element{
    bool        bIsChainBase;
    char        cAction;
    TagId       Ele;
    struct _Chain *pChildChain;
    struct _Attr  *pFirstAttr;
    struct _Attr  *pLastAttr;
    DOMString   sNewText;
    struct _Element *pPrev;
    struct _Element *pNext;
}Element;
```

Fig. 4D

Chain

```
typedef struct _Chain{
    bool        bIsApplied
    struct _Element   *pChainBase;
    struct _Element   *pFirstElement;
    struct _Element   *pLastElement;
    struct _Chain     *pPrev;
    struct _Chain     *pNext;
}Chain;
```

Fig. 4E

Chains

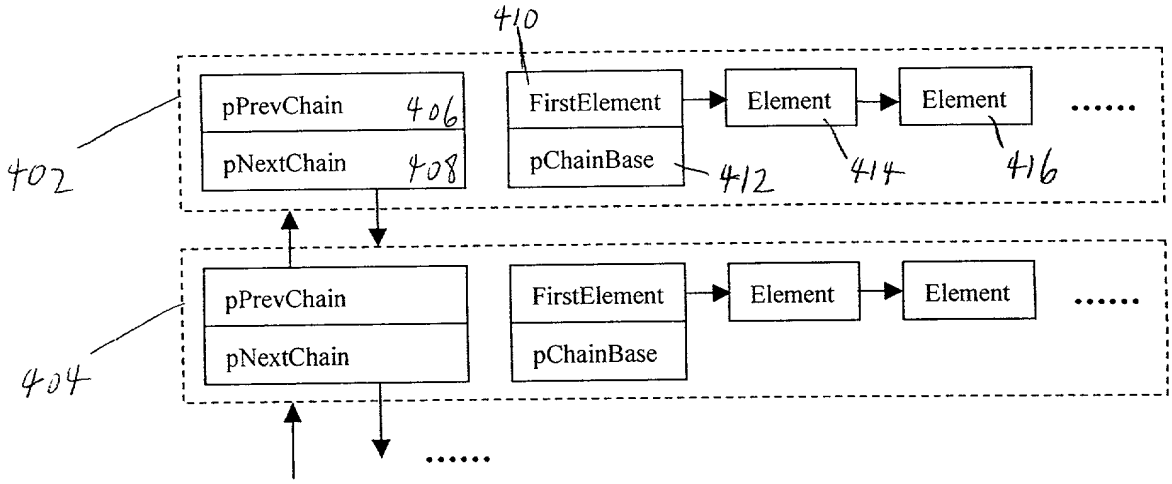


Fig. 4F

Deleted Chain

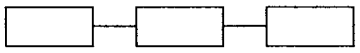


Fig. 4G

Sequence Chain

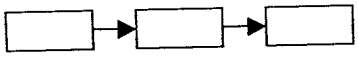


Fig. 4H

Sequence Chain with child Chain

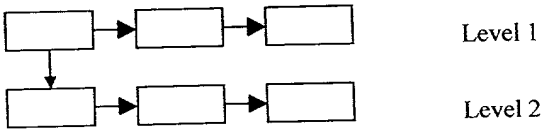


Fig. 4I

```
typedef struct _Card{
    int             iCard;
    int             iEntry;
    struct _Chain *pFirstChain;
    struct _Chain *pLastChain;
    struct _Chain  DelChain;
    struct _Unit   *pFirstUnit;
    struct _Unit   *pLastUnit;
    struct _Card   *pPrev;
    struct _Card   *pNext;
}Card;
```

Fig. 4J

```
typedef struct _Page{
    int             iPage;
    struct _Card   *pFirstCard;
    struct _Card   *pLastCard;
    struct _Var    *pRootTmpVar;
    struct _Var    *pRootSrcVar;
    struct _Page   *pPrev;
    struct _Page   *pNext;
}Page;
```

Fig. 4K

```
typedef struct _Attr{
    DOMString   sAttrName;
    DOMString   sAttrValue;
    struct _Attr   *pPrev;
    struct _Attr   *pNext;
}Attr;
```

Fig. 4L

```
typedef struct _Unit{
    struct _Element    *pElement;
    struct _Unit       *pPrev;
    struct _Unit       *pNext
}Unit;
```

Fig. 4M

```
typedef struct _ElementInfo{
    bool               bSourceEleIsLocated,   bTargetEleIsLocated;
    struct _TagId      sourceEle,             targetEle;
    struct _Element    *pSourceElement,       *pTargetElement;
    struct _Chain *    pChainForSourceEle,    *pChainForTargetEle;
}ElementInfo;
```

Fig. 4N

```
typedef struct _Var{
    int          iMaxFrame;
    int          iMaxIFrame;
    DOMString    sFrame;
    bool         bToOutput;
    struct _Var *pPrev;
    struct _Var *pNext;
    struct _Var *pFirstFrame;
    struct _Var *pLastFrame;
    struct _Var *pFirstIFrame;
    struct _Var *pLastIFrame;
}Var;
```

Fig. 4O

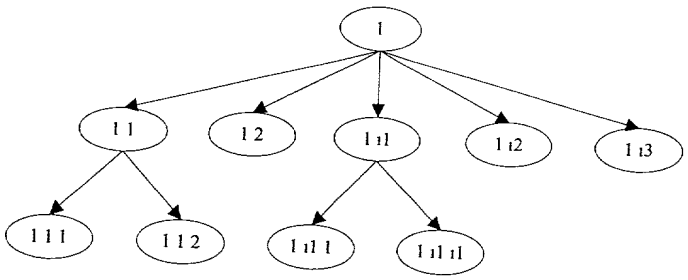


Fig. 4P

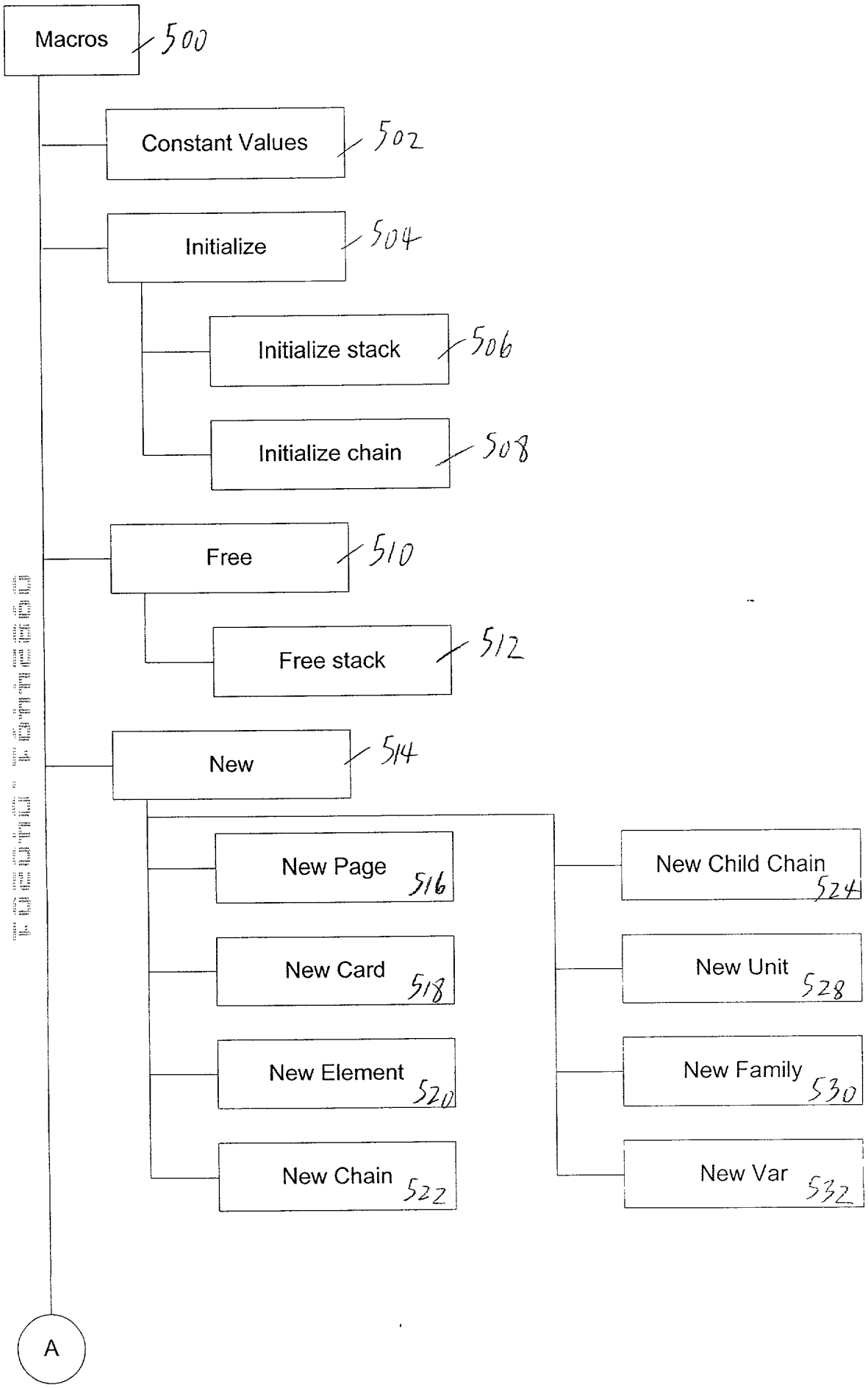

Macros
500
Constant Values
502
Initialize
504
Initialize stack
506
Initialize chain
508
Free
510
Free stack
512
New
514
New Page
516
New Card
518
New Element
520
New Chain
522
New Child Chain
524
New Unit
528
New Family
530
New Var
532
A

Figure 5A

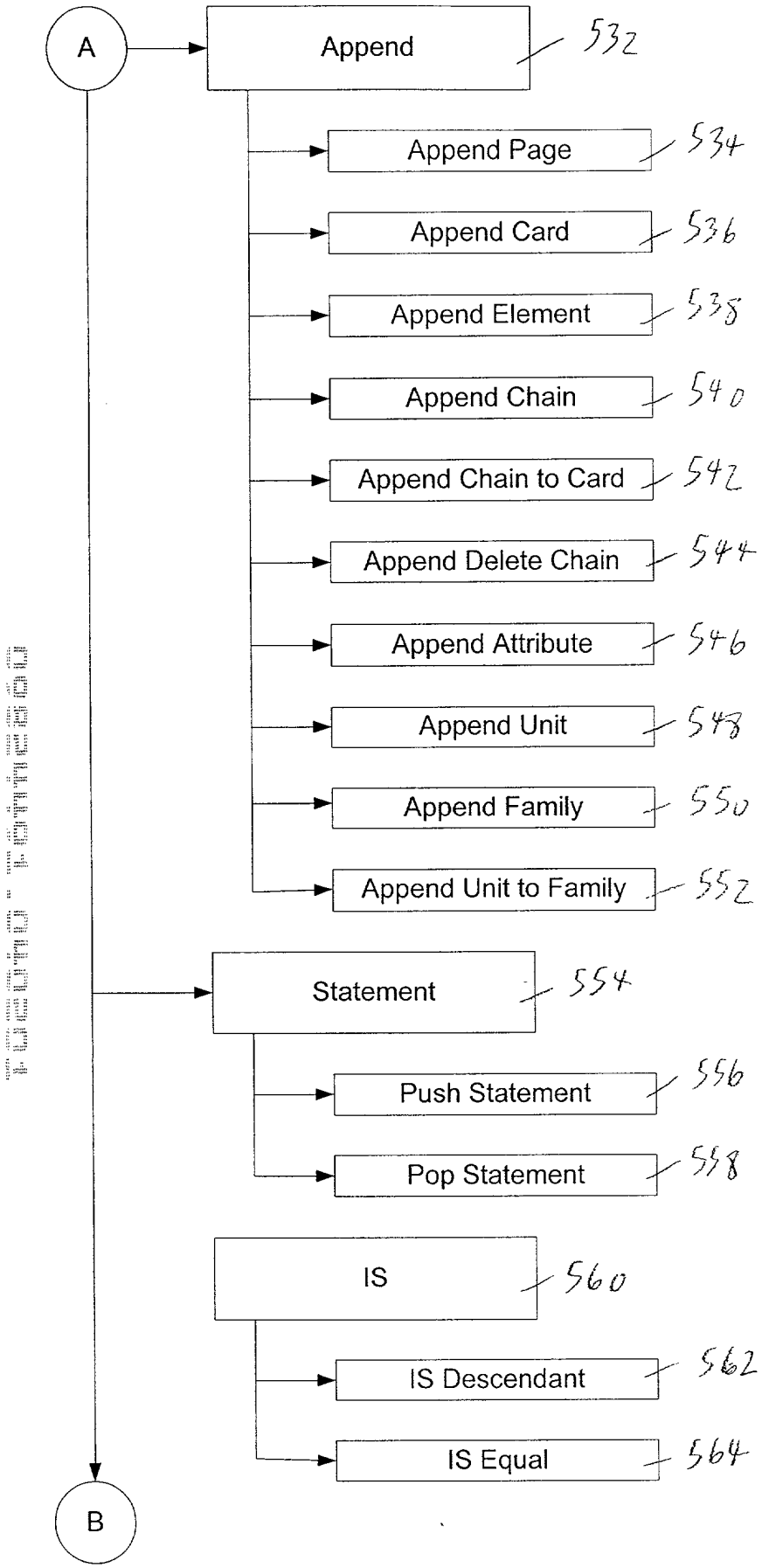

A
Append
532
Append Page
534
Append Card
536
Append Element
538
Append Chain
540
Append Chain to Card
542
Append Delete Chain
544
Append Attribute
546
Append Unit
548
Append Family
550
Append Unit to Family
552
Statement
554
Push Statement
556
Pop Statement
558
IS
560
IS Descendant
562
IS Equal
564
B

Figure 5B

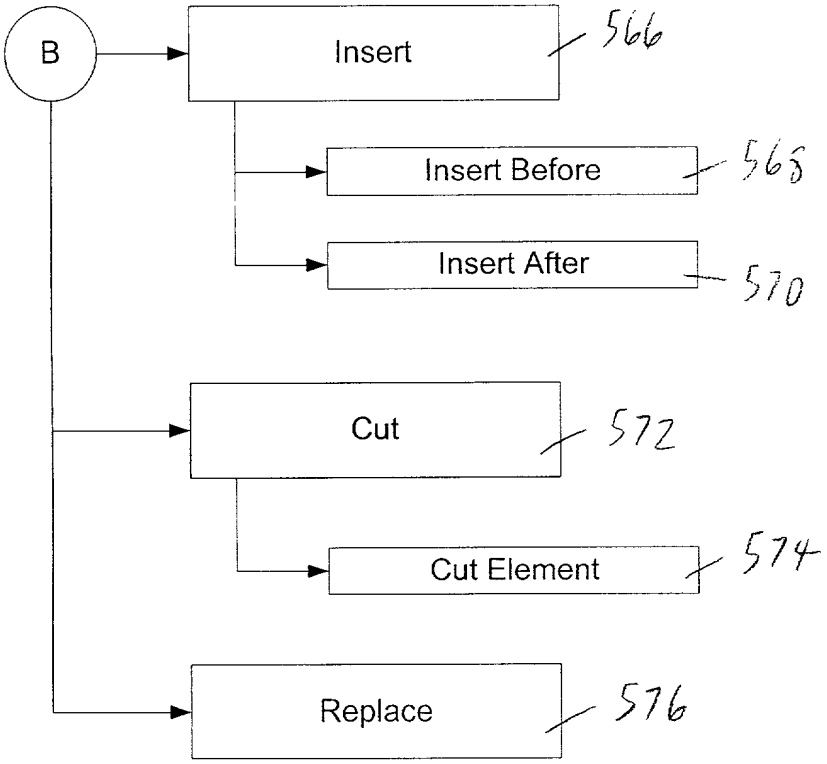

B
Insert
566
Insert Before
568
Insert After
570
Cut
572
Cut Element
574
Replace
576

Figure 5C

Public Methods

Constructor

```
m_pFirstPage = NULL;
m_pLastPage      = NULL;
m_pFirstChain    = NULL;
m_pLastChain= NULL;
m_pFirstDelChain= NULL;
m_pLastDelChain  = NULL;

m_bCanRedo = m_bCanUndo = false;
INIT_STACK(m_redoStack);
INIT_STACK(m_undoStack);

NEW_CHILD_CHAIN(m_pDelChain);
```

Fig. 6A

Deconstructor

```
FREE_STACK(m_redoStack);
FREE_STACK(m_undoStack);

for(pPage = m_pFirstPage; pPage != NULL; ){
    for(pCard = pPage->pFirstCard; pCard != NULL; ){
        for(pChain = pCard->pFirstChain; pChain != NULL; ){
            pChain = DeleteChain(pChain, pCard, FROM_CARD);
        }
        FREE(pPage->pFirstCard, pCard);
    }
    FREE(m_pFirstPage, pPage);
}
for(pChain = m_pFirstDelChain; pChain != NULL; )
    pChain = DeleteChain(pChain, NULL, FROM_M_PFIRSTDELCHAIN);
```

Fig. 6B

Statement Methods

B. A. R. S. E

```
//set statement
pStatement = new Statement;
pStatement->bNewAction = bNewAction;
pStatement->cAction = cAction;
pStatement->sourceEle = sourceEle;
pStatement->targetEle = targetEle;
pStatement->pPrev = 0;
pStatement->pNext = 0;

//Push into redoStack
PUSH_STATEMENT(redoStack, pStatement);

//set undo/redo
m_bCanUndo = true;

return;
```

Fig. 7A

P. D.

```
//set statement
pStatement = new Statement;
pStatement->bNewAction = bNewAction;
pStatement->cAction = cAction;
pStatement->sourceEle = sourceEle;
pStatement->targetEle = sourceEle;
pStatement->pPrev = 0;
pStatement->pNext = 0;

//Push into redoStack
PUSH_STATEMENT(redoStack, pStatement);

//set undo/redo
m_bCanUndo = true;

return;
```

Fig. 7B

T.

```
//set statement
pStatement = new Statement;
pStatement->bNewAction = bNewAction;
pStatement->cAction = 'T';
pStatement->sourceEle = sourceEle;
pStatement->targetEle = sourceEle;
pStatement->iNumOfAttr = iNumOfAttr;
pStatement->pPrev = 0;
pStatement->pNext = 0;

//allocate memory for psNewAttrName and psNewAttrValue of pStatement
pStatement->psNewAttrName = new DOMString[iNumOfAttr];
pStatement->psNewAttrValue = new DOMString[iNumOfAttr];

//set psNewAttrName and psNewAttrValue of pStatement
for(i=0;i<iNumOfAttr;i++){
    (pStatement->psNewAttrName)[i] = psNewAttrName[i];
    (pStatement->psNewAttrValue)[i] = psNewAttrValue[i];
}

//Push into redoStack
PUSH_STATEMENT(m_redoStack, pStatement);

//set undo/redo
m_bCanUndo = true;

return;
```

Fig. 7C

V.

```
//set statement
pStatement = new Statement;
pStatement->bNewAction = bNewAction;
pStatement->cAction = 'V';
pStatement->sourceEle = sourceEle;
pStatement->targetEle = sourceEle;
pStatement->sNewText = sNewText;
pStatement->pPrev = 0;
pStatement->pNext = 0;

//Push into redoStack
PUSH_STATEMENT(m_redoStack, pStatement);

//set undo/redo
m_bCanUndo = true;

return;
```

Fig. 7D

Undo Statement

```
//pop out from redoStack
POP_STATEMENT(m_redoStack, pStatement);

//push into undoStack
PUSH_STATEMENT(m_undoStack, pStatement);

//set redo/undo
m_bCanRedo = true;
if(m_redoStack.pFirstStatement == NULL)
    m_iCanUndo = false;
return;
```

Fig. 8A

Redo Statement

```
//pop out from undoStack
POP_STATEMENT(m_undoStack, pStatement);

//push into redoStack
PUSH_STATEMENT(m_redoStack, pStatement);

//set redo/undo
m_bCanUndo = true;
if(m_undoStack.pFirstStatement == NULL)
    m_iCanRedo = false;

return;
```

Fig. 8B

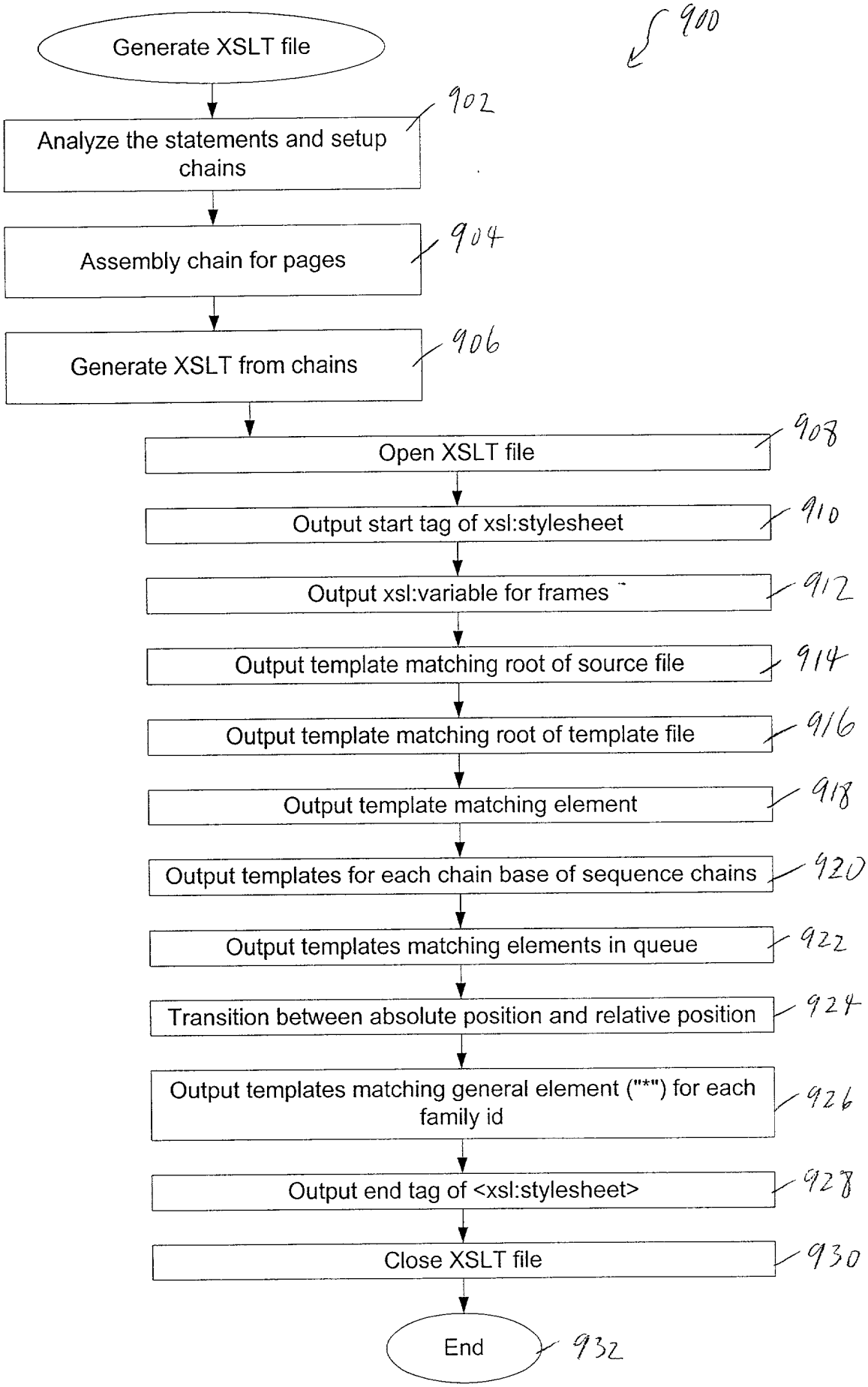

900
Generate XSLT file
902
Analyze the statements and setup chains
904
Assembly chain for pages
906
Generate XSLT from chains
908
Open XSLT file
910
Output start tag of xsl:stylesheet
912
Output xsl:variable for frames
914
Output template matching root of source file
916
Output template matching root of template file
918
Output template matching element
920
Output templates for each chain base of sequence chains
922
Output templates matching elements in queue
924
Transition between absolute position and relative position
926
Output templates matching general element ("*") for each family id
928
Output end tag of <xsl:stylesheet>
930
Close XSLT file
932
End

Fig. 9A

Generate XSLT

Step. 1

```
//step 1.1: loop from the first statement to the last statement to assembly sequence chains and
deleted chains
pCurrStatement = m_redoStack.pFirstStatement;
while(pCurrStatement != NULL){
    //step 1.1.1: assembly elementInfo
    elementInfo.sourceEle = pCurrStatement->sourceEle;
    elementInfo.targetEle = pCurrStatement->targetEle;
    elementInfo.pSourceElement = NULL;
    elementInfo.pChainForSourceEle = NULL;
    elementInfo.pTargetElement = NULL;
    elementInfo.pChainForTargetEle = NULL;
    //iPage equals 0 means that the element is from source file
    if(elementInfo.sourceEle.iPage == 0)
        elementInfo.bSourceEleIsLocated = true;
    else
        elementInfo.bTargetEleIsLocated = false;
    //targetEle's iPage is impossible to be = 0
    elementInfo.bTargetEleIsLocated = false;

    //step 1.1.2: Check whether sourceEle and targetEle are in sequence chains and call methods.
    LocateElement(m_pFirstChain, &elementInfo);

    //if targetEle is not in any sequence chain, call NewChain, otherwise call UpdateChain
    if(elementInfo.pTargetElement == NULL)
        NewChain(&elementInfo, pCurrStatement);
    else{
        UpdateChain(&elementInfo, pCurrStatement);
    }

  //step 1.1.3: Transit to the next statement
  pCurrStatement = pCurrStatement->pNext;
}//end of while

//step 1.2: Filter the deleted chain
FilterDelChain(pPage);
```

Fig. 9B

Generate XSLT

Steps 3.4 - 3.7

Step 3.4. Output template matching root of source file

Format

```
<xsl:template match="/">
    <xsl:apply-templates select="$tmp/*" mode="tmp_root_output"/>
</xsl:template>
```

Step 3.5. Output template matching root of template file

Format

```
<xsl:template match="*" mode="tmp_root_output">
    <xsl:copy>
      <xsl:for-each select="@*"><xsl:copy/></xsl:for-each>
      <xsl:apply-templates select="//comment()"/>
      <xsl:apply-templates select=*|text()" mode="tmp_test_# "/>
      ......
      </xsl:copy>
</xsl:template>
```

Fig. 9C

Step 3.6. Output template matching comment

Step 3.7. Output templates for each chain base of sequence chains

Format

```
<xsl:template match="chain base's path" mode="XY_base_##">
    <xsl:apply-templates select="the path of the Element in the chain" mode="x_output_#"/>
    ... ...
</xsl:template>
```

Fig. 9D

Generate XSLT

Step 3.7

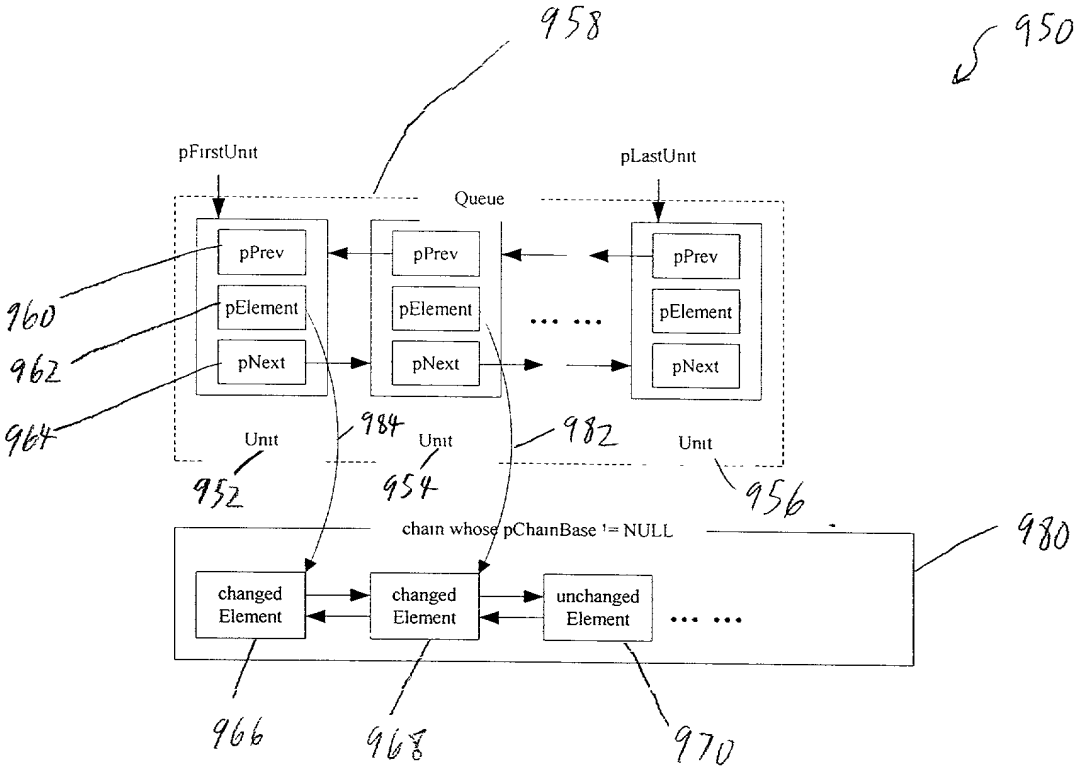


Fig. 9E

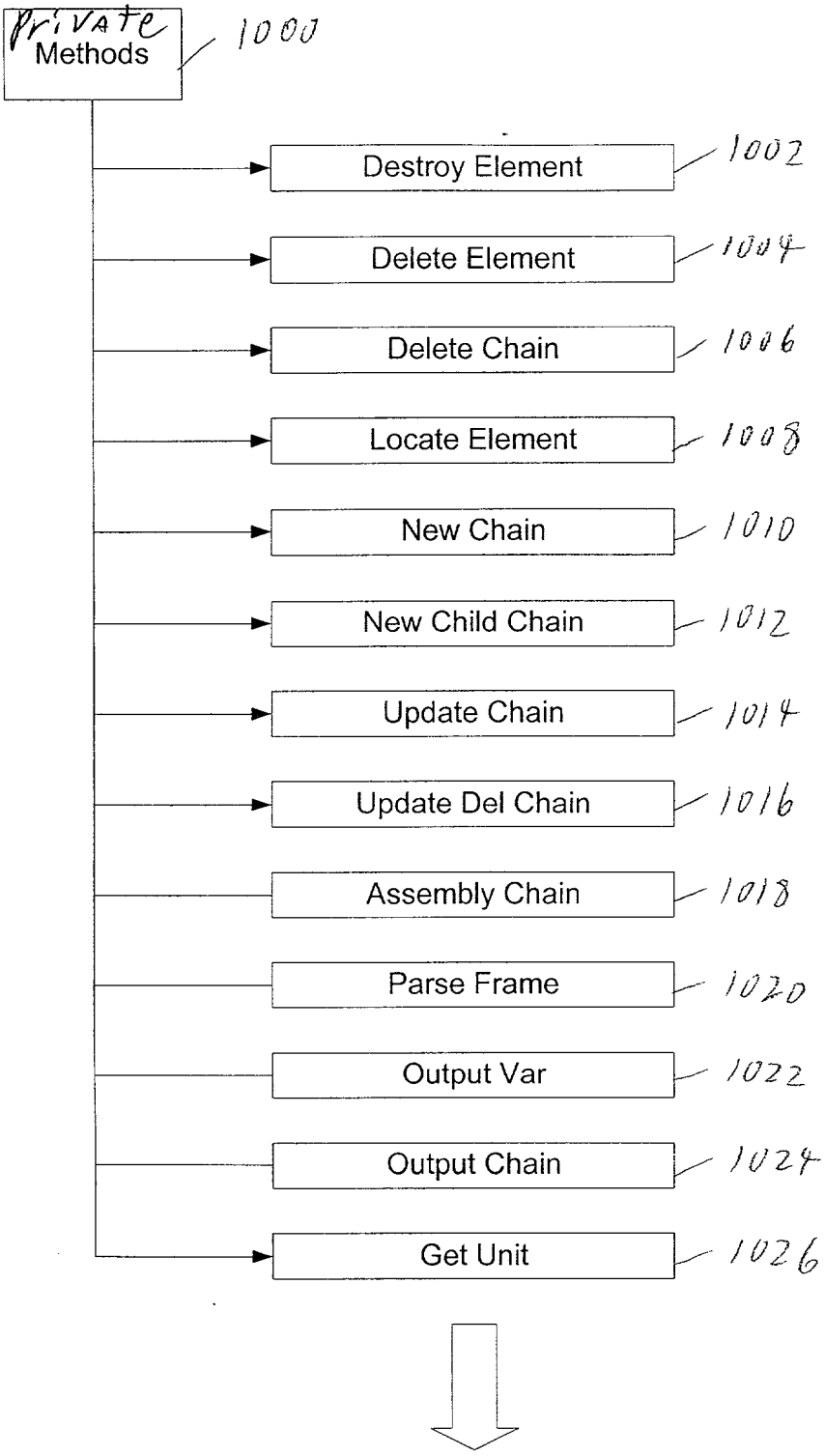

Private Methods
1000
Destroy Element
1002
Delete Element
1004
Delete Chain
1006
Locate Element
1008
New Chain
1010
New Child Chain
1012
Update Chain
1014
Update Del Chain
1016
Assembly Chain
1018
Parse Frame
1020
Output Var
1022
Output Chain
1024
Get Unit
1026

Figure 10

Destroy element

```
if(pElement->pChildChain) DeleteChain(pElement->pChildChain);
free(pElement);
```

Fig. 11A

Delete element

Step 1. Cut the *Element* from the chain.

```
pNext = pElement->pNext;
CUT(pChain->pFirstElement, pChain->pLastElement, pElement);
```

Step 2. Destory it.

```
DestroyElement(pElement);
```

Step 3. Finally return the pointer to the next *Element*.

```
return pNext;
```

Fig. 11B

Delete Chain

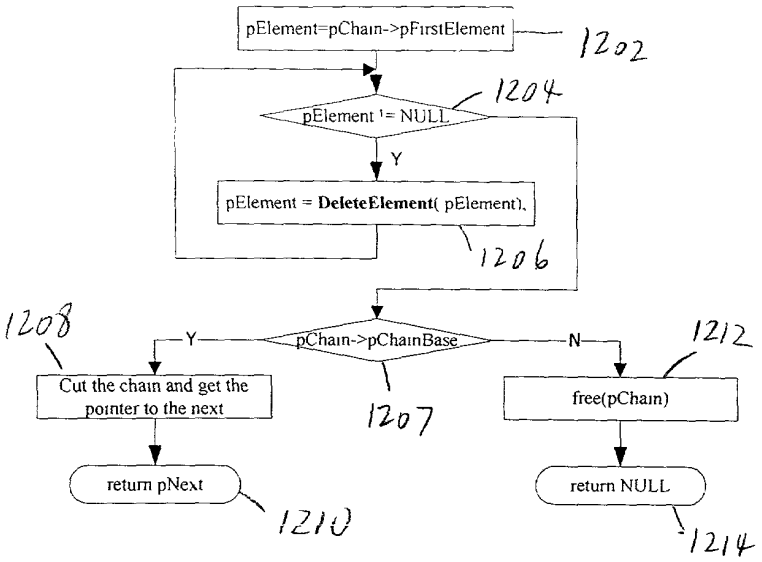


Fig. 12A

Pseudo code

```
pElement = pChain->pFirstElement;
//delete all Elements in this chain
while(pElement){
    pElement = DeleteElement(pChain, pElement);//return the next Element.
}
//delete the chain
if(pChain->pChainBase == NULL){//it is a child chain or Deleted Chain
    free(pChain);
    return NULL;
}
else{
    free(pChain->pChainBase);
    pNext = pChain->pNext;
    switch(mode){
        case FROM_M_PFIRSTCHAIN:
            CUT(m_pFirstChain, m_pLastChain, pChain);
            break;
        case FROM_CARD:
            CUT(pCard->pFirstChain, pCard->pLastChain, pChain);
            break;
        case FROM_M_PFIRSTDELCHAIN:
            CUT(m_pFirstDelChain, m_pDelLastChain, pChain);
            break;

    }
    free(pChain);
```

Fig. 12B

Locate Element (1)

```
sourceEle = pElementInfo->sourceEle;
targetEle = pElementInfo->targetEle;
bSourceEleIsLocated = pElementInfo->bSourceEleIsLocated;
bTargetEleIsLocated = pElementInfo->bTargetEleIsLocated;
//loop for all sequence chains
for(pRefChain = pChain; pRefChain != NULL; pRefChain = pRefChain->pNext){
    //set bToLocateSourceEle and bToLocateTargetEle
    if(pRefChain->pChainBase){
        if(bTargetEleIsLocated == false &&
        pRefChain->pChainBase->Ele.iPage == targetEle.iPage &&
        pRefChain->pChainBase->Ele.iCard == targetEle.iCard)
            bToLocateTargetEle = true;
        else
            bToLocateTargetEle = false;


        if(bSourceEleIsLocated == false &&
        pRefChain->pChainBase->Ele.iPage == sourceEle.iPage &&
        pRefChain->pChainBase->Ele.iCard == sourceEle.iCard)
            bToLocateSourceEle = true;
        else
            bToLocateSourceEle = false;
    }
    else{
        bToLocateSourceEle = !bSourceEleIsLocated;
        bToLocateTargetEle = !bTargetEleIsLocated;
    }
    //if bToLocateSourceEle or bToLocateTargetEle is not true, search in this chain
    if(bToLocateSourceEle || bToLocateTargetEle){
        //loop for all Elements in this chain
        pRefElement = pRefChain->pFirstElement;
        for( ; pRefElement; pRefElement = pRefElement->pNext){
            if(bToLocateSourceEle){
                if(IS_EQUAL(pRefElement->Ele, sourceEle)){
                    pElementInfo->pSourceElement = pRefElement;
                    pElementInfo->pChainForSourceEle = pRefChain;
                    pElementInfo->bSourceEleIsLocated = true;
                    bSourceEleIsLocated = true;
                }
```

Fig. 13A

Locate Element (2)

```
            }
            if(bToLocateTargetEle){
                if(IS_EQUAL(pRefElement->Ele, targetEle)){
                    pElementInfo->pTargetElement = pRefElement;
                    pElementInfo->pChainForTargetEle = pRefChain;
                    pElementInfo->bTargetEleIsLocated = true;
                    bTargetEleIsLocated = true;
                }
            }
        //if bToLocateSourceEle or bToLocateTargetEle is not true and this Element
            has child chain, recursively call to search in the child chain.
        if(pRefElement->pChildChain && (!bSourceEleIsLocated || !bSourceEleIsLocated))
            LocateElement(pRefElement->pChildChain, pElementInfo);
        //if both are found, return, otherwise transit to the next Element.
        if((pElementInfo->bSourceEleIsLocated) && (pElementInfo->bTargetEleIsLocated))
            return;
        }//end of loop for pRefElement
    }//end of if(bToLocateSourceEle || bToLocateTargetEle)
    else{
        //impossible to be here.
    }
```

Fig. 13B

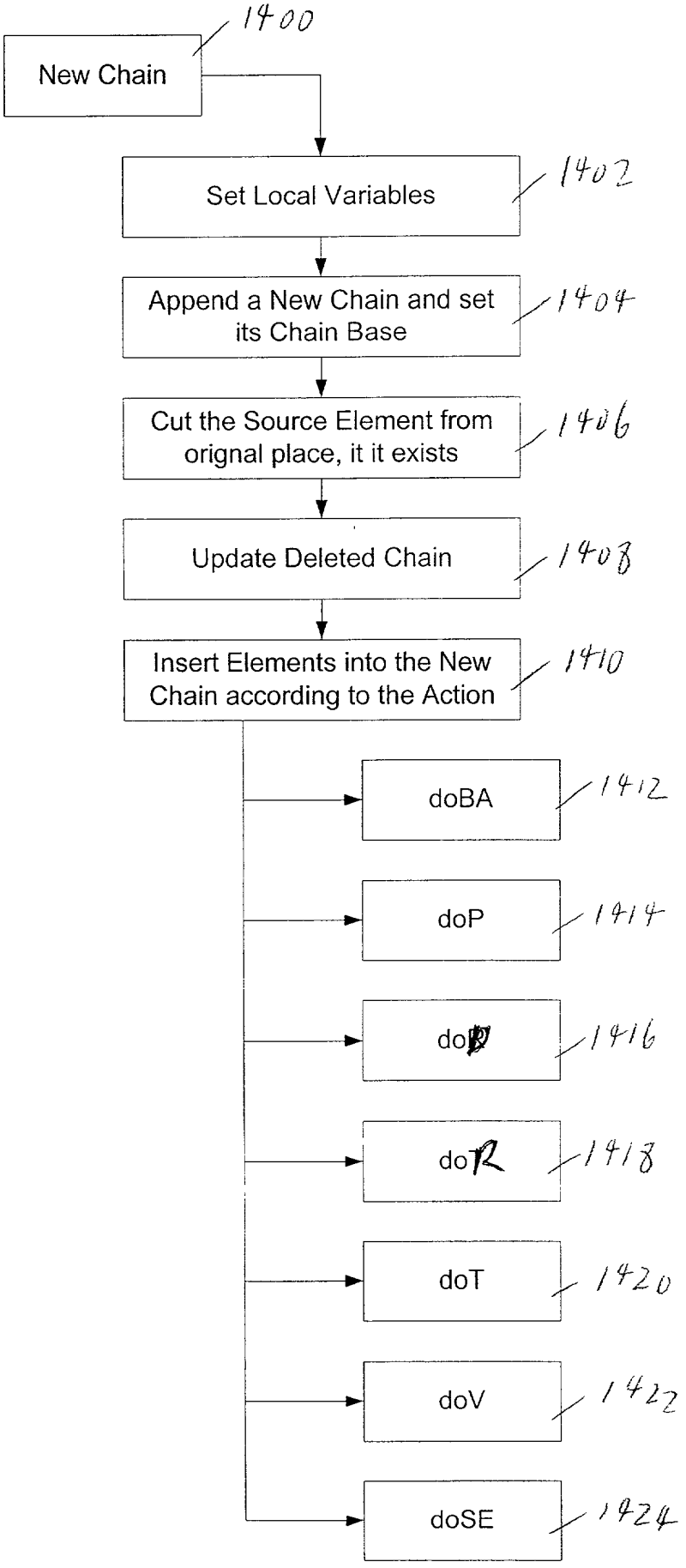

1400
New Chain
Set Local Variables
1402
Append a New Chain and set its Chain Base
1404
Cut the Source Element from orignal place, it it exists
1406
Update Deleted Chain
1408
Insert Elements into the New Chain according to the Action
1410
doBA
1412
doP
1414
doD
1416
doR
1418
doT
1420
doV
1422
doSE
1424

Figure 14A

new Chain (1)

Step 1.: Set local variables

```
sourceEle = pStatement->sourceEle; targetEle = pStatement->targetEle;
cAction = pStatement->cAction;
pSourceElement = pElementInfo->pSourceElement;
pTargetElement = pElementInfo->pTargetElement;
```

Step 2. Append a new chain and set its chain base.

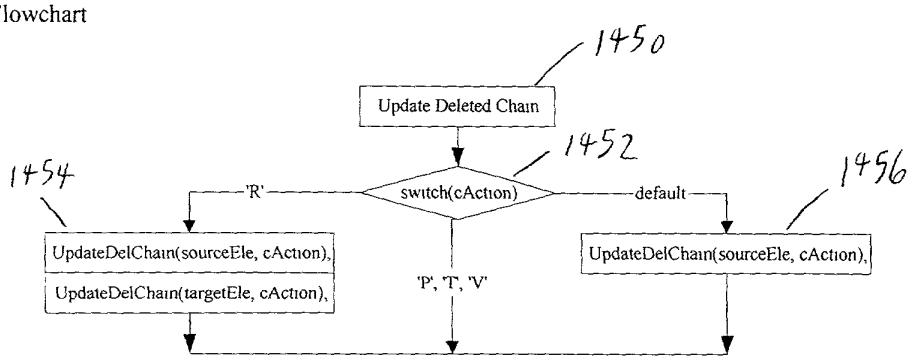
```
if(cAction != 'D'){
    NEW_CHAIN(pChain, targetEle);
    APPEND_CHAIN(pChain);
}
```

Step 3 Cut the source Element from the original place if it exists

```
if(pSourceElement &&
    (cAction == 'B' || cAction == 'A' || cAction == 'S' || cAction == 'E' ||
    cAction == 'R' || cAction == 'D')
    ){
    //Cut the Element from the original place.
    CUT(pElementInfo->pChainForSourceEle->pFirstElement,
        pElementInfo->pChainForSourceEle->pLastElement,
        pSourceElement);
}
//other actions are PTV
```

Step 4 Update deleted chain

Flowchart



Pseudo code

```
switch(cAction){
    case 'R': UpdateDelChain(sourceEle, cAction);
              UpdateDelChain(targetEle, cAction); break;
    case 'P':
    case 'T':
    case 'V': break;
    default: UpdateDelChain(sourceEle, cAction); break;//'B', 'A', 'S', 'E', 'D'
}
```

Fig. 14B

New Chain (2)

Step 5 Insert Elements into the new chain according to the action

Top level flowchart for this step

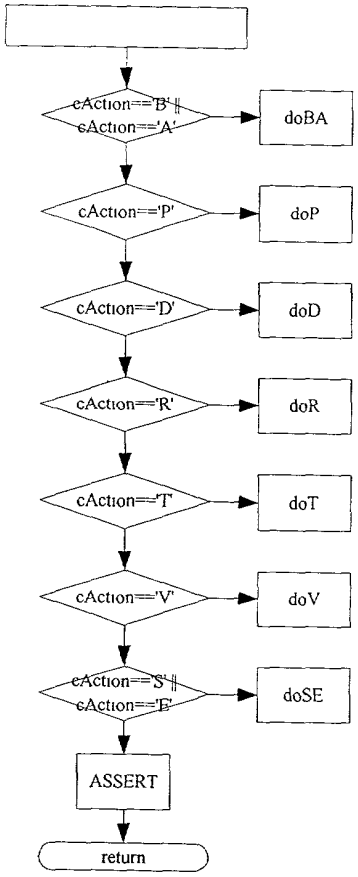


Fig. 14C

BASIC Rules for operation NewChain

attr: attribute

cA: cAction

SE: sourceEle

TE: targetEle

EE: emptyEle

AP: absolute position

RP: relative position

X(AP): X(sourceEle or targetEle or 'div') with absolute position

X(RP): X(sourceEle or targetEle or 'div') with relative position

XAP: if X(sourceEle or targetEle) has absolute position

XRP: if X(sourceEle or targetEle) has relative position

→X: insert *Element*(X) into the current chain

→X→Y: insert *Element*(X) and *Element*(Y)into the current chain orderly

AP(X): X's absolute position attribute

N_C: NEW_CHAIN(), append the new chain and set its chainBase.

'X': if cAction is 'X'

YES(X), NOT(X): X is true, false;

X(Y): change X's attribute Y.

X(AP)=X(RP)+AP(Y): add Y's absolute position attribute to X.

X(AP)=X(RP)+AP; add user action's AP to X

X(RP)=X(AP)-AP: delete X's AP attribute, then X(AP) becomes X(RP)

→X[→Y→Z]:insert an *Element*(X), into which two children: *Element*(Y) and *Element*(Z) are inserted.

→TE[cA, →SE]: when cA equals 'S', this abbreviation equals →TE[→SE→EE], when cA equals 'E', this abbreviation equals →TE[→EE→SE]

//X: X is comment

Fig. 14D

SE's position	TE's position	Final positon of *Element*(targetEle) or *Element*(div)
RP	RP	RP
AP	RP	RP
RP	AP	AP
AP	AP	targetEle's AP

Fig. 14E

3. Examples

After new a chain and set its chain base, insert Elements into the new chain according to the following table.

In this table, "content" means the attributes and text.

In the 2nd column of this table, "▼" means the row involves absolute position.

Action	What user wants to do	What Rule Generator do
B	Insert SE(RP) before TE(RP)	→SE(RP)→TE(RP)
	▼Insert SE(RP) before TE(AP)	AP(div)=AP(TE); TE(RP)=TE(AP)-AP; →div(AP)[→SE(RP)→TE(RP)]

	▼Insert SE(AP) before TE(RP)	SE(RP)=SE(AP)-AP; //then SE(AP) becomes SE(RP)
		→SE(RP)→TE(RP)

	▼Insert SE(AP) before TE(AP)	AP(div)=AP(TE); SE(RP)=SE(AP)-AP; TE(RP)=TE(AP)-AP; →div(AP)[→SE(RP)→TE(RP)] //use a div to wrap SE and TE
A	simliar as B	
P	▼move SE(RP) to AP	SE(AP)=SE(RP)+AP; →SE(AP);
	▼move SE(AP) to another AP	SE(AP); →SE(AP);
D	Delete this element	
R	Use SE(RP) to replace TE(RP)	→SE(RP);

	▼Use SE(RP) to replace TE(AP)	SE(AP)=SE(RP)+AP(TE); //SE(RP) becomes SE(AP)
		→SE(AP)

	▼Use SE(AP) to replace TE(RP)	SE(RP)=SE(AP)-AP; //SE(AP) becomes SE(RP)
		→SE(RP)

	▼Use SE(AP) to replace TE(AP)	AP(SE)=AP(TE) →SE(AP)
T	Change SE' attr	doD; //nothing to do with AP and RP
V	Replace SE's text	doV; //nothing to do with AP and RP
S	Insert SE(RP) to be child of TE(RP)	→TE(RP)[→SE(RP)→EE]
	▼Insert SE(RP) to be child of TE(AP)	→TE(AP)[→SE(RP)→EE]
	▼Insert SE(AP) to be child of TE(RP)	SE(RP)=SE(AP)-AP; →TE(RP)[→SE(RP)→EE]
	▼Insert SE(AP) to be child of TE(AP)	SE(RP)=SE(AP)-AP; →TE(AP)[→SE(RP)→EE]
E	similar as S	

Fig. 14F

doBA (1)

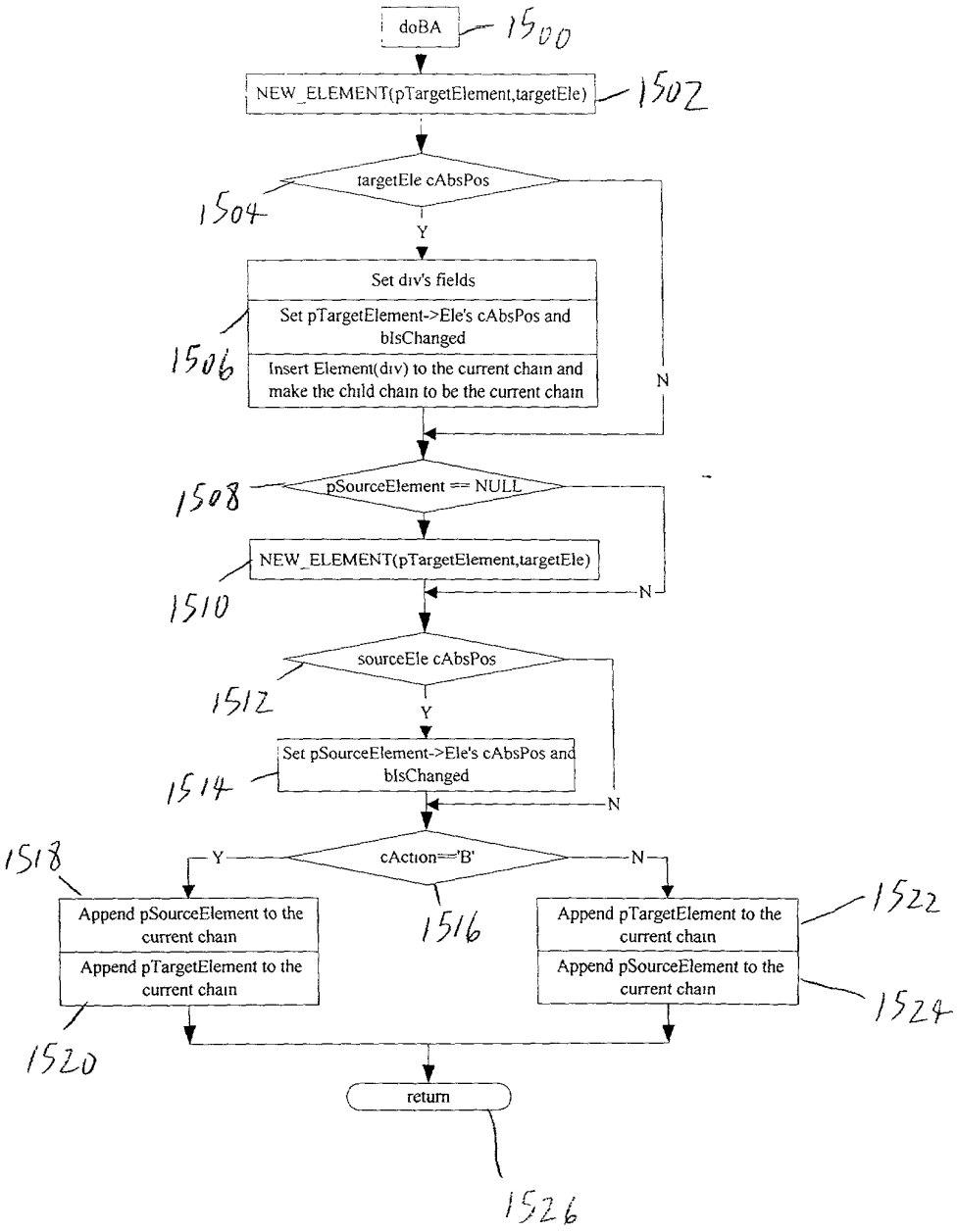


Fig. 15A

doBA (2)

Pseudo code

```
//if targetEle has absolute position, a div will be used to wrap sourceEle and targetEle
//The caller of Rule Generator sets the field cAbsPos to indicate the position status of the element:
absolute position or relative position
NEW_ELEMENT(pTargetElement, targetEle);

if(targetEle.cAbsPos){
    //set tag name
    div.sNewTag = "div";
    //Because targetEle does not exist in any chain, the reference absolute position is used for div.
    div.cAbsPos = REF_ABS_POS;

    div.sAbsPos = targetEle.sPath;

    //Set div's sFrame and sPath
    div.sFrame = targetEle.sFrame;
    div.sPath = targetEle.sPath;

    //set bIsAbsPosOrg and cAbsPos to indicate that the absolute position attribute shall not be
output when XSLT is applied.
    pTargetElement->Ele.cAbsPos = NO_ABS_POS;

    //set bIsChanged to indicate targetEle is changed.
    pTargetElement->Ele.bIsChanged = true;

    //new an Element for div and append to the current new chain
    NEW_ELEMENT(pDivElement, div);
    pDivElement->bIsChainBase = true;
    APPEND_ELEMENT(pChain, pDivElement);

    //make a new chain to be the child chain of div
    pChain = new Chain;
    pDivElement->pChildChain = pChain;
}
else //!!
    pTargetElement->bIsChainBase = true;

//if sourceEle does not exist in any chain, make a new Element for sourceEle
if( ! pSourceElement){
    NEW_ELEMENT(pSourceElement, sourceEle);
}
```

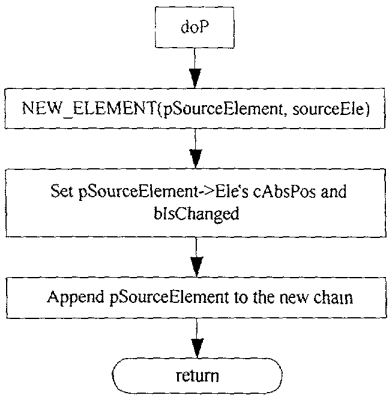
Fig. 15B

do BA (3)

```
//if sourceEle is absolute position, set bIsAbsPosOrg, cAbsPos and bIsChanged to indicate that the
absolute position attribute of sourceEle shall not be output and sourceEle is changed.
if(sourceEle.cAbsPos){
    pSourceElement->Ele.cAbsPos = NO_ABS_POS;
    pSourceElement->Ele.bIsChanged = true;
}

//append pSourceElement and pTargetElement according to the action
if(cAction == 'B'){
    APPEND_ELEMENT(pChain, pSourceElement);
    APPEND_ELEMENT(pChain, pTargetElement);
}
else{
    APPEND_ELEMENT(pChain, pTargetElement);

    APPEND_ELEMENT(pChain, pSourceElement);
}
```

Fig. 15C

doP



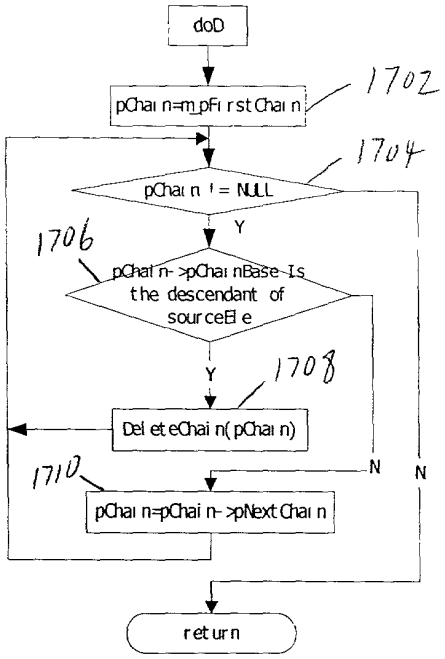
Pseudo code

When the statement is pushed into the redoStack, if the action is PTV, sourceEle and targetEle is set to the same value. So when targetEle is not found in any chain, the sourceEle shall not appear in any chain. Therefore a new *Element* is made for sourceEle.

```
NEW_ELEMENT(pSourceElement, sourceEle);
pSourceElement->Ele.cAbsPos = REAL_ABS_POS;
pSourceElement->Ele.bIsChanged = true;
//the position (x, y) has been set by the caller of Rule Generator.

pSourceElement->bIsChainBase = true;
APPEND_ELEMENT(pChain, pSourceElement);
```

Fig. 16

dod



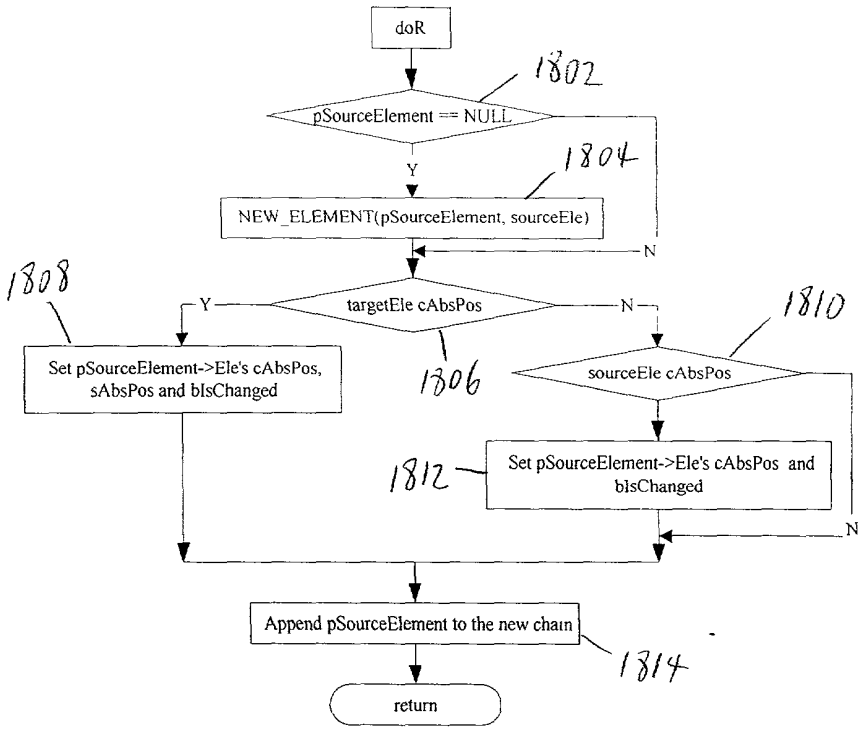
Pseudo Code

Check all chains. If the chain base of a chain is the descendant of sourceEle, delete that chain.

```
for(pChain = m_pFirstChain; pChain != NULL;){
    if(IS_DESCENDANT (pChain->pChainBase->Ele, sourceEle))
        pChain = DeleteChain(pChain);//return the pointer of the next chain
    else
        pChain = pChain->pNext;
}
```

Fig. 17

doR

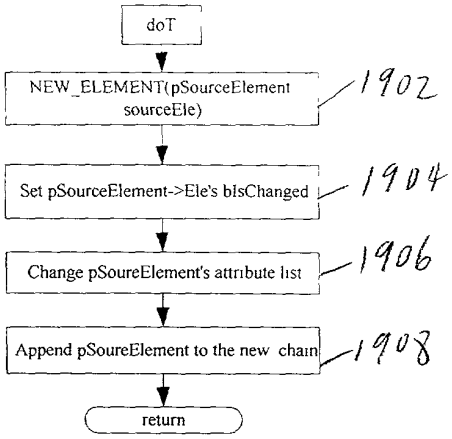


Pseudo code

```
if( ! pSourceElement ){
    NEW_ELEMENT(pSourceElement, sourceEle);
}
if(targetEle.cAbsPos){

    pSourceElement->Ele.cAbsPos = REF_ABS_POS;
    pSourceElement->Ele.sAbsPos = targetEle.sPath;
    pSourceElement->Ele.bIsChanged = true;
}
else{
    if(sourceEle.cAbsPos){
        pSourceElement->Ele.cAbsPos = NO_ABS_POS;
        pSourceElement->Ele.bIsChanged = true;
    }
}

APPEND_ELEMENT(pChain, pSourceElement);
```

Fig. 18

doT

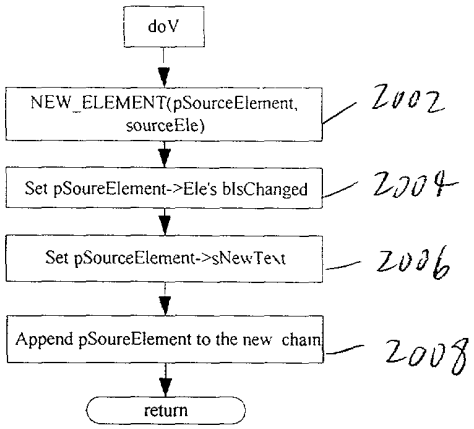


Pseudo code

```
//set the Element
NEW_ELEMENT(pSourceElement, sourceEle);
pSourceElement->Ele.bIsChanged = true;


//scan the attribute list

psNewAttrName = pStatement->psNewAttrName;
psNewAttrValue = pStatement->psNewAttrValue;
for(i=0;i<pStatement->iNumOfAttr; i++){
    pAttr = new Attr;
    //set the body of pAttr
    pAttr->sAttrName= psNewAttrName[i];
    pAttr->sAttrValue= psNewAttrValue[i];
    pAttr->pPrev = pAttr->pNext = NULL;

    APPEND_ATTR(pSourceElement, pAttr);
}
//append the source Element to the chain
pSourceElement->bIsChainBase = true;
APPEND_ELEMENT(pChain, pSourceElement);
```

Fig. 19

doV

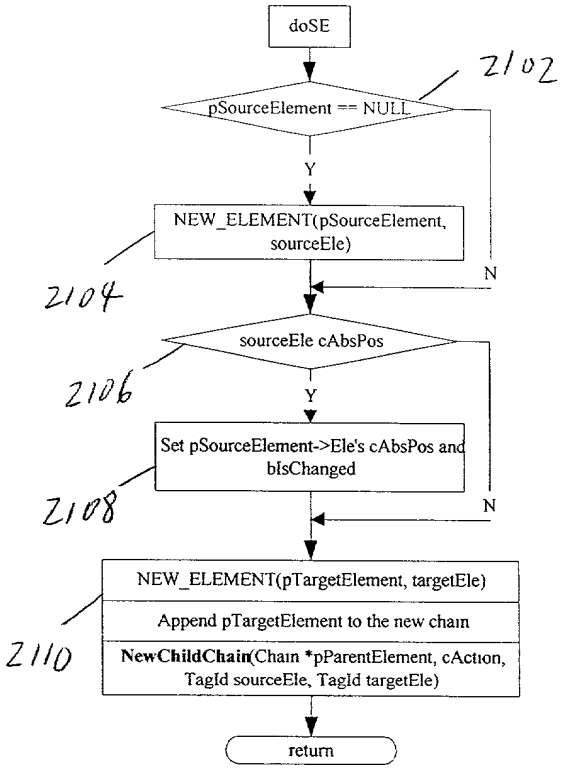


Pseudo code

```
NEW_ELEMENT(pSourceElement, sourceEle);
pSourceElement->Ele.bIsChanged = true;

pSourceElement->sNewText = pStatement->sNewText;

pSourceElement->bIsChainBase = true;
APPEND_ELEMENT (pChain, pSourceElement);
```

Fig. 20

doSE



Pseudo Code

```
pTargetElement->Ele.bIsChanged = true;

if( ! pSourceElement){
    NEW_ELEMENT(pSourceElement, sourceEle);
}

if(sourceEle.cAbsPos){
    pSourceElement->Ele.cAbsPos = NO_ABS_POS;
    pSourceElement->Ele.bIsChanged = true;
}

NEW_ELEMENT(pTargetElement, targetEle);

pTargetElement->bIsChainBase = true;
APPEND_ELEMENT (pChain, pTargetElement);
NewChildChain(pTargetElement, cAction, pSourceElement);
```

Fig. 21

newChildChain

Pseudo code

```
//New a child chain for the input Element
NEW_CHILD_CHAIN(pChain);
pParentElement->pChildChain = pChain;
pChain->pParentElement = pParentElement;
//New a empty Element
emptyEle.iFamilyId = -1;//-1 represent this is a empty Element
NEW_ELEMENT(pEmptyElement, emptyEle);

//Append two Elements according to the action
if(cAction =='S'){
    APPEND_ELEMENT(pChain, pSourceElement);
    APPEND_ELEMENT(pChain, pEmptyElement);
}
else{//cActio = 'E'
    APPEND_ELEMENT(pChain, pEmptyElement);
    APPEND_ELEMENT(pChain, pSourceElement);
}
```

Fig, 22

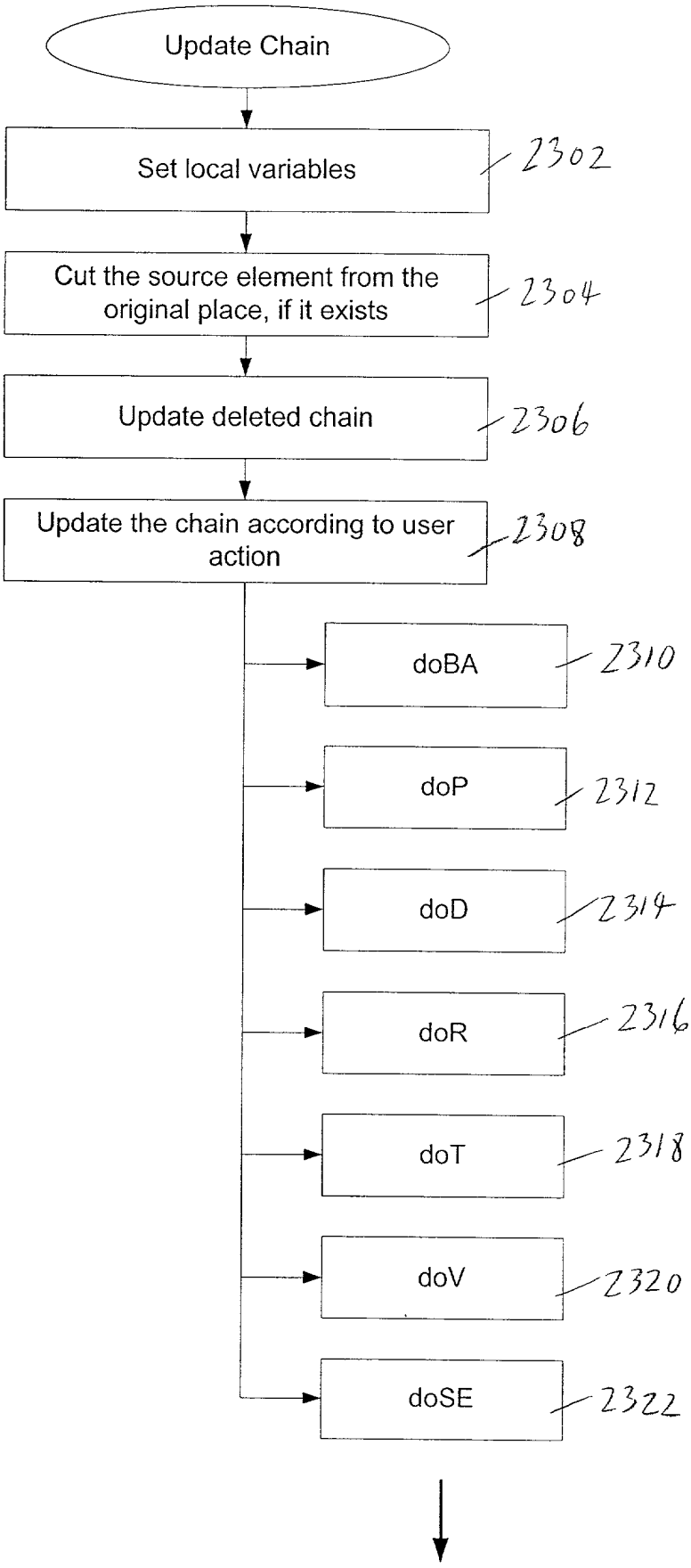

Update Chain
Set local variables
2302
Cut the source element from the original place, if it exists
2304
Update deleted chain
2306
Update the chain according to user action
2308
doBA
2310
doP
2312
doD
2314
doR
2316
doT
2318
doV
2320
doSE
2322

Figure 23A

Update Chain (1)

Step 1 Set local variables

```
sourceEle = pStatement->sourceEle; targetEle = pStatement->targetEle;
cAction = pStatement->cAction;
pSourceElement = pElementInfo->pSourceElement;
pTargetElement = pElementInfo->pTargetElement;

pChainForSourceEle = pElementInfo->pChainForSourceEle;
pChainForTargetEle = pElementInfo->pChainForTargetEle;
```

Step 2 Cut the source Element from the original place if it exists(the same as that in NewChain)

```
if(pSourceElement &&
    (cAction == 'B' || cAction == 'A' || cAction == 'S' || cAction == 'E' ||
    cAction == 'R' || cAction == 'D')
    ){

    //Cut the Element from the original place.
    CUT(pElementInfo->pChainForSourceEle->pFirstElement,
        pElementInfo->pChainForSourceEle->pLastElement,
        pSourceElement);
}
//other actions are PTV
```

Step 3 Update Deleted Chain (the same as that in NewChain)

```
switch(cAction){
    case 'R': UpdateDelChain(sourceEle, cAction);
              UpdateDelChain(targetEle, cAction);break;
    case 'T':
    case 'V': break;
    default: UpdateDelChain(sourceEle, cAction); break;// 'B' 'A' 'S', 'E', 'D'
    }
```

Fig. 23B

Update chain (2)

Step 4 Update the chain according to user action

Top level flowchart

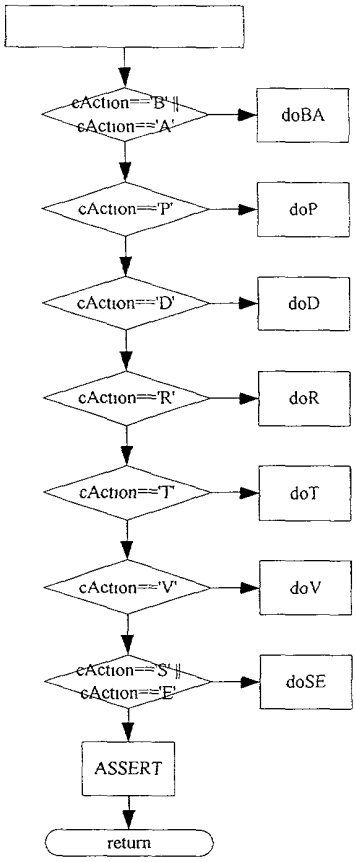


Fig. 23C

39c

Basic rules for the above operation UpdateChain

1. Abbreviation

Two abbreviations are defined besides the ones in NewChain

→{X}: X is an Element that is already in the current chain.

→X→~~Y~~: Replace *Element*(Y) with *Element*(X).

2. Handle different positions(the same as that in NewChain)

3. Examples

Action	What user wants to do	What Rule Generator do
B	Insert SE(RP) before TE(RP)	→SE(RP)→{TE(RP)}
	▼Insert SE(RP) before TE(AP)	AP(div)=AP(TE); TE(RP)=TE(AP)-AP; →div(AP)[→SE(RP)→TE(RP)]→~~TE(AP)~~

	▼Insert SE(AP) before TE(RP)	SE(RP)=SE(AP)-AP; //then SE(AP) becomes SE(RP)
		→SE(RP)→{TE(RP)}

	▼Insert SE(AP) before TE(AP)	AP(div)=AP(TE); SE(RP)=SE(AP)-AP; TE(RP)=TE(AP)-AP; →div(AP)[→SE(RP)→TE(RP)]→~~TE(AP)~~ //use a div to wrap SE and TE
A	simliar as B	
P	▼move SE(RP) to AP	SE(AP)=SE(RP)+AP;
	▼move SE(AP) to another AP	SE(AP);
D	Delete this element	
R	Use SE(RP) to replace TE(RP)	→SE(RP)→~~TE(RP)~~;

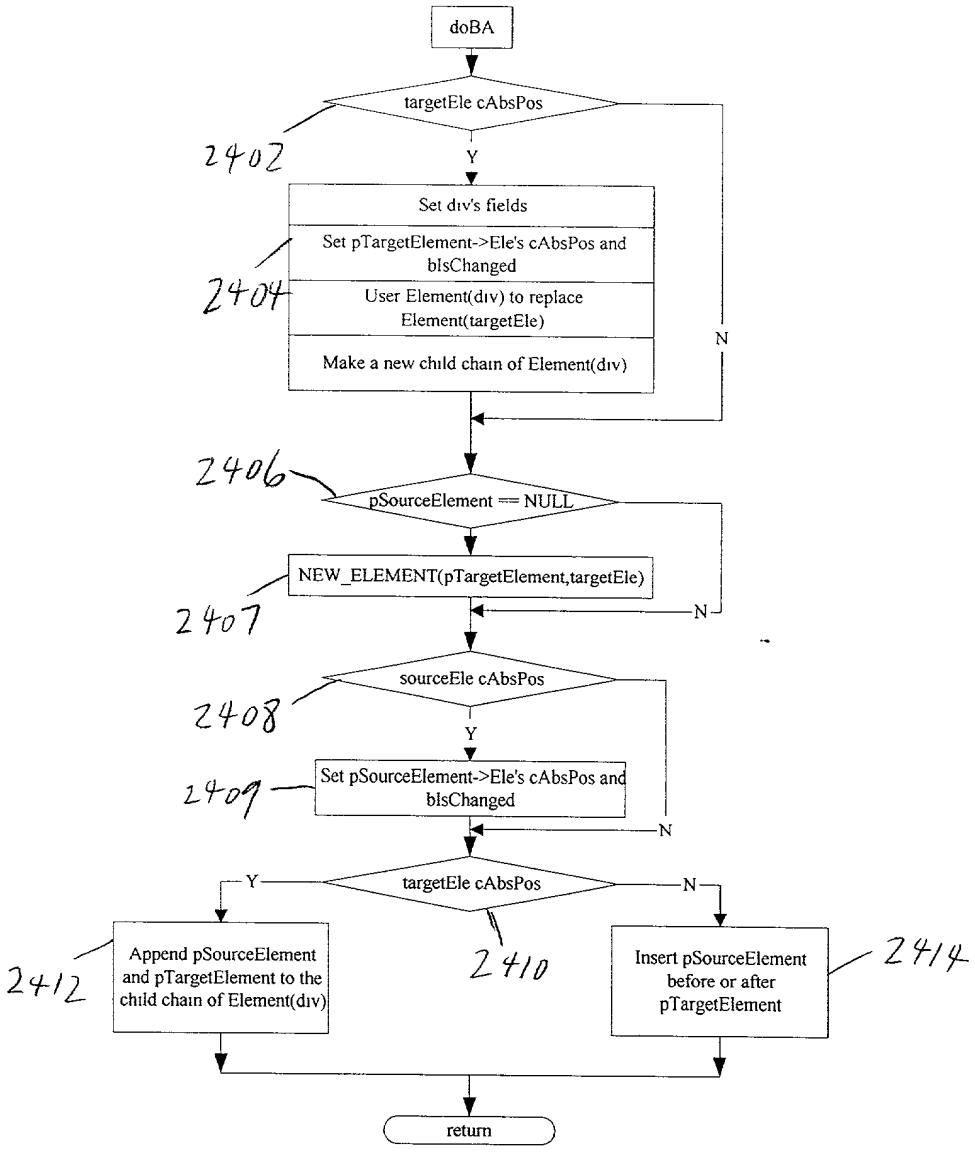
	▼Use SE(RP) to replace TE(AP)	SE(AP)=SE(RP)+AP(TE); //SE(RP) becomes SE(AP)
		→SE(AP)→~~TE(AP)~~

	▼Use SE(AP) to replace TE(RP)	SE(RP)=SE(AP)-AP; //SE(AP) becomes SE(RP)
		→SE(RP)→~~TE(RP)~~

	▼Use SE(AP) to replace TE(AP)	AP(SE)=AP(TE) →SE(AP)→~~TE(AP)~~
T	Change SE' attr	doD; //nothing to do with AP and RP
V	Replace SE's text	doV; //nothing to do with AP and RP
S	Insert SE(RP) to be child of TE(RP)	→{TE(RP)}[→SE(RP)→EE]
	▼Insert SE(RP) to be child of TE(AP)	→{TE(AP)}[→SE(RP)→EE]
	▼Insert SE(AP) to be child of TE(RP)	SE(RP)=SE(AP)-AP; →{TE(RP)}[→SE(RP)→EE]
	▼Insert SE(AP) to be child of TE(AP)	SE(RP)=SE(AP)-AP; →{TE(AP)}[→SE(RP)→EE]
E	similar as S	

Fig. 23D

doBA (1)



Pseudo code

```
//if targetEle has absolute position, a div will be used to wrap sourceEle and targetEle
//The caller of Rule Generator sets the field cAbsPos to indicate the position status of the element:
absolute position or relative position
if(targetEle.cAbsPos){
    //set tag name
    div.sNewTag = "div";
    //set targetEle's absolute position attribute to div
    div.cAbsPos = targetEle.cAbsPos;
    //when cAbsPos is REF_ABS_POS, sPath is used, otherwise (x, y) is used.
    div.sAbsPos = targetEle.sAbsPos;
```

Fig. 24A

doBA(2)

```
        div.x = targetEle.x;
        div.y = targetEle.y;
        //set targetEle.cAbsPos to NO_ABS_POS indicate that the absolute position attribute shall not be output when XSLT is applied.
        pTargetElement->Ele.cAbsPos = NO_ABS_POS;

        //set bIsChanged to indicate targetEle is changed.
        pTargetElement->Ele.bIsChanged = true;

        //new an Element for div and append to the current new chain
        NEW_ELEMENT(pDivElement, div);
        //use Element(div) to replace Element(targetEle)
        REPLACE(pChainForTargetEle->pFirstElement, pChainForTargetEle->pLastElement, pTargetElement, pDivElement);

        //make a new chain to be the child chain of div
        pDivChain = new Chain;
        pDivElement->pChildChain = pDivChain;
    }

    //if sourceEle does not exist in any chain, make a new Element for sourceEle
    if( ! pSourceElement){
        NEW_ELEMENT(pSourceElement, sourceEle);
    }
    //if sourceEle is absolute position, set bIsAbsPosOrg, cAbsPos and bIsChanged to indicate that the absolute position attribute of sourceEle shall not be output and sourceEle is changed.
    if(sourceEle.cAbsPos){
        pSourceElement->Ele.cAbsPos = NO_ABS_POS;
        pSourceElement->Ele.bIsChanged = true;
    }

    if(targetEle.cAbsPos){
        if(cAction == 'B'){
            APPEND_ELEMENT (pDivChain, pSourceElement);
            APPEND_ELEMENT (pDivChain, pTargetElement);
        }
        else{
            APPEND_ELEMENT (pDivChain, pTargetElement);
            APPEND_ELEMENT (pDivChain, pSourceElement);
        }
    }
    else{
        if(cAction == 'B'){
            INSERT_BEFORE(pChainForTargetEle->pFirstElement, pSourceElement, pTargetElement);
        }
        else{
            INSERT_AFTER (pChainForTargetEle->pFirstElement, pTargetElement, pSourceElement);
        }
    }
```

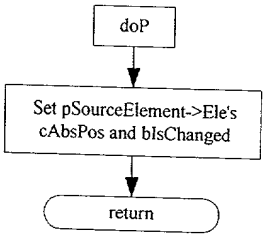
Fig. 24B

406

doP

- doP:

Flowchart

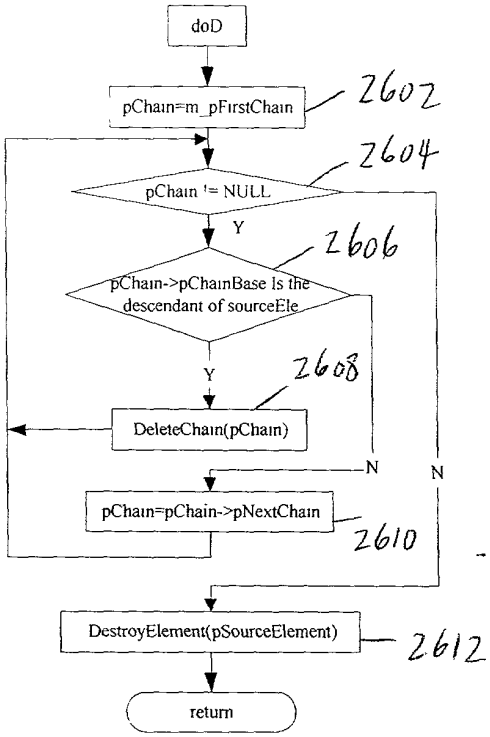


Pseudo code

```
pSourceElement->Ele.cAbsPos = REAL_ABS_POS;
pSourceElement->Ele.bIsChanged = true;
```

Fig. 25

doD

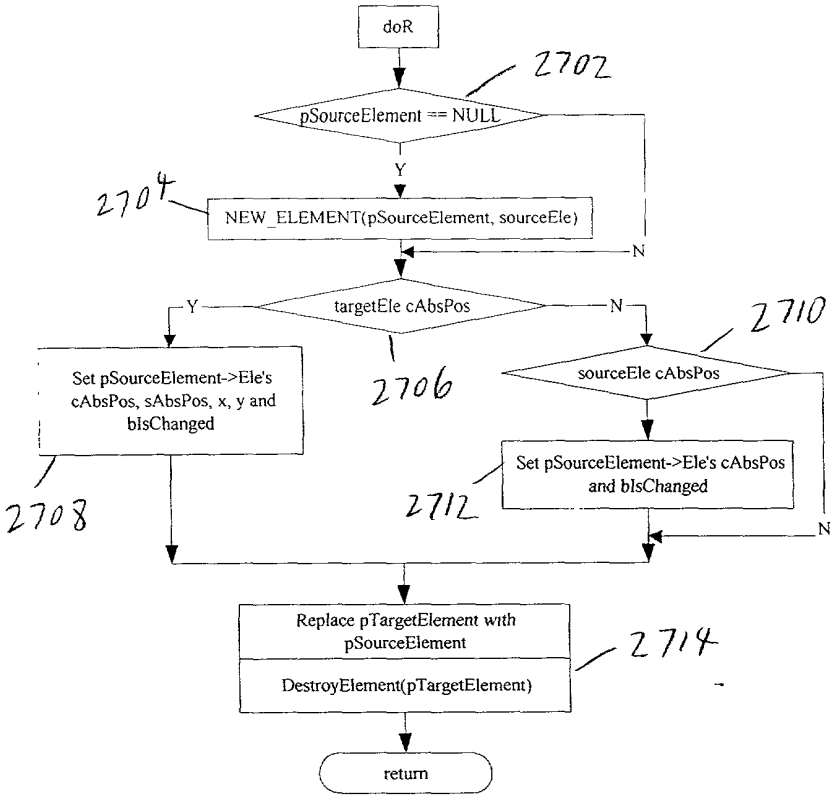


Pseudo code

```
for(pChain = m_pFirstChain; pChain != NULL;){

    if(IS_DESCENDANT(pChain->pChainBase->Ele, pSourceElement->Ele))
        pChain = DeleteChain(pChain);//return the pointer of the next chain
    else
        pChain = pChain->pNext;

}
//pSourceElement has been cut from the original place and it is totally destroyed now.
DestroyElement(pSourceElement);
```

Fig. 26

doR



Pseudo code

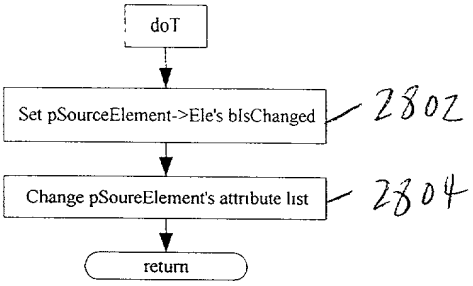
```
if( ! pSourceElement ) NEW_ELEMENT(pSourceElement, sourceEle);
if(targetEle.cAbsPos){
    //set targetEle's absolute position attribute to sourceEle
    pSourceElement->Ele.cAbsPos = targetEle.cAbsPos;
    pSourceElement->Ele.sAbsPos = targetEle.sAbsPos;
    pSourceElement->Ele.x = targetEle.x;
    pSourceElement->Ele.y = targetEle.y;
    pSourceElement->Ele.bIsChanged = true;
}
else{
    if(sourceEle.cAbsPos){
        pSourceElement->Ele.cAbsPos = NO_ABS_POS;
        pSourceElement->Ele.bIsChanged = true;
    }
}
```

REPLACE(pChainForTargetEle->pFirstElement, pChainForTargetEle->pLastElement, pTargetElement, pSourceElement)

//after replacement, pTargetElement is cut from the original place, so destroy it now.

Fig. 27

doT



Pseudo code

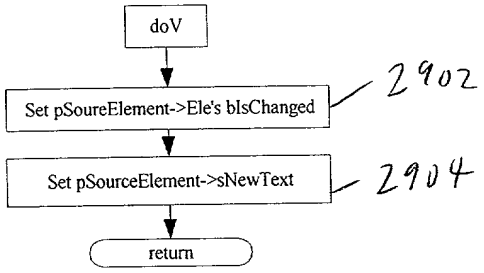
```
pSourceElement->Ele.bIsChanged = true;

//scan the attribute list
psNewAttrName = pStatement->psNewAttrName;
psNewAttrValue = pStatement->psNewAttrValue;
for(i=0;i<pStatement->iNumOfAttr; i++){
    for(pAttr=pSourceElement->pFirstAttr; pAttr != NULL; pAttr=pAttr->pNext){
        if(psNewAttrName[i] == pAttr->sAttrName){
            pAttr->sAttrValue = psNewAttrValue[i];
            if(pAttr->sAttrValue.length() == 0){
                CUT(pSourceElement->pFirstAttr, pSourceElement->pLastAttr, pAttr);
                pTempAttr = pSourceElement->pFirstAttr;
                INSERT_BEFORE(pSourceElement->pFirstAttr, pAttr, pTemp);
            }
            break;//jump to where
        }
    }
    //not found
    pAttr = new Attr;
    //set the body of pAttr
    pAttr->sAttrName= psNewAttrName[i];
    pAttr->sAttrValue= psNewAttrValue[i];
    pAttr->pPrev = pAttr->pNext = NULL;

    if(pAttr->sAttrValue.length()){
        APPEND_ATTR(pSourceElement, pAttr);
    }
    else{
        pTempAttr = pSourceElement->pFirstAttr;
        INSERT_BEFORE(pSourceElement->pFirstAttr, pAttr, pTempAttr);
    }
}
```

Fig. 28

doV

- doV:

Flowchart

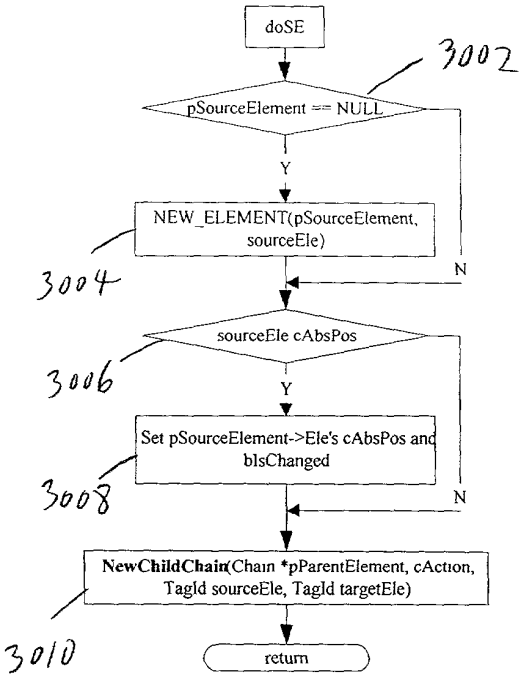


Pseudo code

```
pSourceElement->Ele. bIsChanged = true;
pSourceElement->sNewText = pStatement->sNewText;
```

Fig. 29

doSE



Pseudo code

```
pTargetElement->Ele.bIsChanged = true;

if( ! pSourceElement) NEW_ELEMENT(pSourceElement, sourceEle);
if(sourceEle.cAbsPos){
    pSourceElement->Ele.cAbsPos = NO_ABS_POS;
    pSourceElement->Ele.bIsChanged = true;
}

if(pTargetElement->pChildChain){
    if(cAction == 'S'){
        pElement = pTargetElement->pChildChain->pFirstElement;
        INSERT_BEFORE(pTargetElement->pChildChain->pFirstElement, pSourceElement,
pElement);
    }
    else{
        APPEND_ELEMENT(pTargetElement->pChildChain, pSourceElement);
    }
}
else
    NewChildChain(pTargetElement, cAction, pSourceElement);
```

Fig. 30

Update Del Chain

```
pRefElement = m_pDelChain->pFirstElement;
while(pRefElement != NULL){
      if(IS_EQUAL(pRefElement->Ele, Ele)){
            pRefElement->cAction = cAction;
            return;
      }
      pRefElement = pRefElement ->pNext;
}

NEW_ELEMENT(pElement, Ele);
APPEND_ELEMENT(m_pDelChain, pElement);
return;
```

Fig. 31

FilterDelChain

```
pCurrElement = m_DelChain->pFirstElement;
while(pCurrElement != NULL){
    if(Element is from source file){
    //look for its yougest ancestor
    bHasAncestor = false;
    pRefElement = m_pDelChain->pFirstElement;
    for( ; pRefElement != NULL; pRefElement = pRefElement->pNext) {
        if(pRefElement != pCurrElement){
            if (IS_DESCENDANT(pRefElement->Ele, pCurrElement->Ele)){
                if(bHasAncestor){
                    if(IS_DESCENDANT(pYougestAncestor->Ele, pRefElement->Ele)){
                        pYougestAncestor = pRefElement;
                    }
                }

                 else{
                      bHasAncestor = true;
                      pYougestAncestor = pRefElement;
                 }
            }
        }
    }
    if(bHasAncestor )
        if(pYougestAncestor->cAction != 'D')
    //Note: when put an exist Element into Deleted Chain, that action of Element is overwritten.
            pCurrElement->Ele.cAbsPos = false;//mark it not to be deleted
        else
            pCurrElement->Ele.cAbsPos = true;
    else
        pCurrElement->Ele.cAbsPos = true;//has no ancestor, mark it to be deleted later
    }//if(element is in source file
    else
        pCurrElement->Ele.cAbsPos = false;
    pCurrElement = pCurrElement->pNext;
}

//Remove Elements whose cAbsPos = true
pCurrElement=m_pDelChain->pFirstElement;
while(pCurrElement != NULL){
    if(pCurrElement->Ele.cAbsPos)
        pCurrElement=DeleteElement(&m_DelChain, pCurrElement);
    else
        pCurrElement=pCurrElement->pNext;
}
```

Fig. 32

Assembly Chain

```
//Assembly chains cards and pages according to the field iPage and iCard of structure TagId
for( pChain = m_pFirstChain; pChain != NULL; pChain = pChain->pNext){
    for(pPage = m_pFirstPage; pPage != NULL; pPage = pPage->pNext){
        if(pChain->pChainBase->Ele.iPage == pPage->iPage){
            for( pCard = pPage->pFirstCard; pCard != NULL; pCard = pCard->pNext){
                if(pChain->pChainBase->Ele.iCard == pCard->iCard){
                    CUT(m_pFirstChain, m_pLastChain, pChain);
                    APPEND_CHAIN_TO_CARD(pCard, pChain);

                    if(pCard->iEntry == HAS_NOT_ENTRY)
                        pCard->iEntry = pChain->pChainBase->Ele.iFamilyId;
                    goto NEXT_CHAIN;
                }
            }
        }
    }
    NEW_PAGE(pPage, pChain->pChainBase->Ele.iPage)
    APPEND_PAGE(this, pPage);
    NEW_CARD(pCard, pChain->pChainBase->Ele.iCard);
    APPEND_CARD(pPage, pCard);
    CUT(m_pFirstChain, m_pLastChain, pChain);
    APPEND_CHAIN_TO_CARD(pCard, pChain);

    if(pCard->iEntry == HAS_NOT_ENTRY){
        pCard->iEntry = pChain->pChainBase->Ele.iFamilyId;
NEXT_CHAIN:
    ;
}
//Assembly Elements in Deleted Chains according to FamilyId.
for(pElement = m_pDelChain->pFirstElement; pElement != NULL; pElement =
pElement->pNext){
    for(pChain = m_pFirstDelChain; pChain != NULL; pChain = pChain->pNext){
        if(pElement->Ele.iFamilyId == pChain->pFirstElement->Ele.iFamilyId){
            CUT(m_pDelChain->pFirstElement, m_pDelChain->pLastElement, pElement);
            APPEND_ELEMENT(pChain, pElement);
            goto NEXT_DEL_ELEMENT;
        }
    }
    NEW_CHILD_CHAIN(pChain);
    APPEND_DEL_CHAIN(pChain);
    APPEND_ELEMENT(pChain, pElement);
NEXT_DEL_ELEMENT:
    ;
```

Fig. 33

ParseFrame (1)

```
//
if(pChain->pChainBase)
    pElement = pChain->pChainBase;
else
    pElement = pChain->pFirstElement;

bTmpHasFrame = bSrcHasFrame = true;

while(pElement != NULL && (bSrcHasFrame || bTmpHasFrame)){

    if(pElement->bIsChainBase) bChainBaseIsFound = true;

    if(pElement->Ele.sPath.charAt(0) == 't'){
            cFrom = TEMPLATE;
        if(bTmpHasFrame)
            pVar = pPage->pRootTmpVar;
        else
            goto NEXT_ELEMENT;
    }
    else if(pElement->Ele.sPath.charAt(0) == 's'){
        cFrom = SOURCE;
        if(bSrcHasFrame)
            pVar = pPage->pRootSrcVar;
        else
            goto NEXT_ELEMENT;
    }
    else{
        //DEBUG
        printf("wrong path!\n");
    }

    sFrame = pElement->Ele.sFrame;
    iMaxLayer = GetLayerNumber(sFrame);
```

Fig. 34A

ParseFrame (2)

```
for(i=0;i<iMaxLayer;i++){

    iFirstDotPos = GetFirstCharPos(sFrame, '.');

    if(iFirstDotPos != -1){
        sTemp = sFrame.substringData(0, iFirstDotPos);
        sFrame = sFrame.substringData(iFirstDotPos+1, sFrame.length()-iFirstDotPos);
    }
    else
        sTemp = sFrame;

    if(sTemp.charAt(0) == 'i'){
        bIsFrame = false;
        sTemp = sTemp.substringData(1, sTemp.length()-1);
    }
    else
        bIsFrame = true;

    if(sTemp.length() == 0){//the page containing this element has no frame.

        if(cFrom == TEMPLATE)
            bTmpHasFrame = false;
        else
            bSrcHasFrame = false;

        goto NEXT_ELEMENT;
    }
    else
        iFrameIndex = atoi(sTemp.transcode());

    if(bIsFrame){
        if(iFrameIndex < pVar->iMaxFrame){
            pVar = pVar->pFirstFrame;
            for(i=1;i<iFrameIndex; i++){
                pVar = pVar->pNext;
            }
            goto NEXT_ELEMENT;
        }
        else{
            for(j = pVar->iMaxFrame; j < iFrameIndex; j++){
                itoa(j+1, szBuffer, 10);
                sCurrFrame = szBuffer;
```

Fig. 34B

506

ParseFrame (3)

```
                    if(pVar != pPage->pRootSrcVar && pVar != pPage->pRootTmpVar)
                        sCurrFrame = pVar->sFrame + "." + sCurrFrame;

                    NEW_VAR(pNewVar, sCurrFrame);
                    APPEND(pVar, pNewVar, Frame);
                }//loop for j
                pVar->iMaxFrame = iFrameIndex;
                pVar = pVar->pLastFrame;
            }
        }
        else{
            if(iFrameIndex < pVar->iMaxIFrame){
                pVar = pVar->pFirstIFrame;
                for(i=1;i<iFrameIndex; i++){
                    pVar = pVar->pNext;
                }
                goto NEXT_ELEMENT;
            }
            else{
                for(j = pVar->iMaxIFrame; j < iFrameIndex; j++){
                    itoa(j+1, szBuffer, 10);

                    sCurrIFrame = szBuffer;

                    if(pVar != pPage->pRootSrcVar && pVar != pPage->pRootTmpVar)
                        sCurrFrame = pVar->sFrame + "." + sCurrFrame;

                    NEW_VAR(pNewVar, sCurrIFrame);
                    APPEND(pVar, pNewVar, IFrame);
                }
                pVar->iMaxIFrame = iFrameIndex;
                pVar = pVar->pFirstIFrame;
            }
        }

        pVar->bToOutput = true;
    }

NEXT_ELEMENT:

    if(pChain->pChainBase == pElement)
            pElement = pChain->pFirstElement;
    else
        pElement = pElement->pNext;
}//end of loop for pElement
```

Fig. 34C

Output Var

```
if(pVar->bToOutput == false) return;

if(pVar->sFrame contains the character '.'){
    iLastDotPos = pVar->sFrame.lastIndexOf(pVar->sFrame, '.');
    iLength = pVar->sFrame.length();

    sParentFrame = pVar->sFrame.substringData(0, iLastDotPos);
    sSelfFrame = pVar->sFrame.substringData(iLastDotPos + 1, iLength - iLastDotPos-1);
}
else{
    sParentFrame = "";

    sSelfFrame = pVar->sFrame;
}

if(the first character of sSelfFrame is 'i'){
    //it is a "iframe"
    bIsIFrame = true;
    sSelfFrame = pVar->sFrame.substringData(iLastDotPos + 1, iLength - iLastDotPos - 1);
}

//Set frame type
sFrameType = bIsFrame ? "iframe" : "frame"

//Output the variable for this frame
←<xsl:variable name="sFrom pVar->sFrame" select="document($"
        sFrom sParentFrame/sFrameType [ sSelfFrame ]/@src)"/>

//Iteratively output the XSLT variables for the frames of the current var
for(pFrame = pVar->pFirstFrame; pFrame ; pFrame = pFrame->pNext){
    OutputVar(xsltFile, pFrame, sFrom);
}
//Iteratively output the XSLT variables for the iframes of the current var
for(pIFrame = pVar->pFirstIFrame; pIFrame ; pIFrame = pIFrame->pNext){
    OutputVar(xsltFile, pIFrame, sFrom);
}
```

Fig. 35

Output Chain

```
pElement = pChain->pFirstElement;

bChainBaseIsFound = false;

while(pElement){
    if(pElement->bIsChainBase) bChainBaseIsFound = true;
    if(pElement->Ele.iFamilyId != EMPTY_ELEMENT){
        szRoot = ((pElement->Ele.sPath.substringData(0, 3))
                + (pElement->Ele.sFrame)).transcode();
        <<xsl:apply-templates select="szRoot sPath"
                mode="szRoot _output_ pElement->Ele.iFamilyId "/>

        NEW_UNIT(pUnit, pElement);

        if(pElement->Ele.bIsChanged == true || pElement->Ele.sNewTag.length()!=0)
            //this Element is changed
            APPEND_UNIT(pCard, pUnit);//the Queue will be scanned later
        }
        else{
            APPEND_UNIT_TO_FAMILY(pCard, pUnit);
        }
    }
    else{//it is the empty Element which is the content of the parent Element of this chain
        szRoot = ((pChain->pParentElement->Ele.sPath.substringData(0, 3))
                + (pChain->pParentElement->Ele.sFrame)).transcode();
        <<xsl:apply-templates select="*|text()" mode="szRoot _test_
                pChain->pParentElement->Ele.iFamilyId"/>
    }
    pElement = pElement->pNext;
}//end of while

//if the chain has chain base and the chain base is not in the chain (i.e. it is moved to other chains
or it is deleted), append the chain base to family according to it family id.
if(!bChainBaseIsFound && pChain->pChainBase){
    NEW_UNIT(pUnit, pChain->pChainBase);
    APPEND_UNIT_TO_FAMILY(pCard, pUnit);
}
```

Fig. 36

Get Unit

```
if(pCard->pFirstUnit){
    pUnit = pCard->pFirstUnit;
    pElement = pCard->pFirstUnit->pElement;
    pCard->pFirstUnit = pCard->pFirstUnit->pNext;
    pCard->pFirstUnit->pPrev = NULL;
    free(pUnit);
    return pElement;
}
else
    return NULL;
```

Fig. 37

Appendix A

2.4. Macros

The following macros are in macro.h

2.4.1. Constant Value

```
#define SOURCE          0
#define TEMPLATE        1

#define NO_ABS_POS      0
#define REF_ABS_POS     1
#define REAL_ABS_POS    2

#define FROM_NOWHERE            0
#define FROM_M_PFIRSTCHAIN      1
#define FROM_CARD               2
#define FROM_M_PFIRSTDELCHAIN   3
```

2.4.2. INIT

2.4.2.1. INIT_STACK

```
#define INIT_STACK(stack)\
    stack.pFirstStatement = NULL;\
    stack.pLastStatement = NULL;
```

2.4.2.2. INIT_CHAIN

```
#define INIT_CHAIN(Chain)\
    Chain.bIsApplied = false;
```

2.4.3. FREE

```
#define FREE(pFirst, p)\
    while(pFirst){\
        p = pFirst->pNext;\
        free(pFirst);\
        pFirst = p;\
    }\
    p = pFirst;
```

2.4.3.1. FREE_STACK

```
#define FREE_STACK(stack)\
    FREE(stack.pFirstStatement, pStatement)
```

2.4.4. NEW

2.4.4.1. NEW_PAGE

```
#define NEW_PAGE(pPage, iChainBasePage)\
    pPage = new Page;\
    pPage->iPage = iChainBasePage;\
    pPage->pFirstCard = NULL;\
    pPage->pLastCard  = NULL;\
    pPage->pRootTmpVar= NULL;\
    pPage->pRootSrcVar= NULL;\
    pPage->pPrev      = NULL;\
    pPage->pNext      = NULL;
```

2.4.4.2. NEW_CARD

```
#define NEW_CARD(pCard, iChainBaseCard)\
    pCard = new Card;\
    pCard->iCard = iChainBaseCard;\
    pCard->iEntry = -1;\
    pCard->pFirstChain     = NULL;\
    pCard->pLastChain= NULL;\
    pCard->pFirstUnit  = NULL;\
    pCard->pLastUnit  = NULL;\
    pCard->pPrev       = NULL;\
    pCard->pNext       = NULL;
```

2.4.4.3. NEW_ELEMENT

```
#define NEW_ELEMENT(pElement, Ele)\
pElement = new Element;
pElement->pPrev = NULL;
pElement->pNext = NULL;
pElement->pFirstAttr = NULL;
pElement->pLastAttr = NULL;
pElement->pChildChain = NULL;
pElement->bIsChainBase = false;
pElement->Ele = Ele;
pElement->Ele.bIsAbsPosOrg = Ele.cAbsPos;
pElement->Ele.bIsChanged = FASLE;
```

2.4.4.4. NEW_CHAIN

```
#define NEW_CHAIN(pChain, targetEle)\
pChain = new Chain;\
pChain->bIsApplied = false;\
NEW_ELEMENT(pChain->pChainBase, targetEle);\
pChain->pFirstElement = NULL;\
pChain->pLastElement = NULL;\
pChain->pPrev = NULL;\
pChain->pNext = NULL;
```

Macro NEW_CHAIN is used in private method NewChain, NewChildChain, NewDivChildChain.

2.4.4.5. NEW_CHILD_CHAIN

```
#define NEW_CHILD_CHAIN(pChain)\
pChain = new Chain;\
pChain->bIsApplied = false;\
pChain->pChainBase = NULL;\
pChain->pFirstElement = NULL;\
pChain->pLastElement = NULL;
pChain->pPrev = NULL;\
pChain->pNext = NULL;
```

2.4.4.6. NEW_UNIT

```
#define NEW_UNIT(pUnit, pElement)\
pUnit = new Unit;\
pUnit->pElement = pElement;\
pUnit->pPrev = NULL;\
pUnit->pNext = NULL;\
```

2.4.4.7. NEW_FAMILY

```
#define NEW_FAMILY(pFamily, pUnit)\
pFamily = new Family;\
pFamily->iFamilyId = pUnit->pElement->Ele.iFamilyId;\
pFamily->pFirstUnit = pFamily->pLastUnit = pUnit;\
pFamily->pPrev = pFamily->pNext = NULL;
```

2.4.4.8. NEW_VAR

```
#define NEW_VAR(pVar, sCurrFrame)\
    pVar            = new Var;\
    pVar->iMaxFrame = 0;\
    pVar->iMaxIFrame= 0;\
    pVar->sFrame    = sCurrFrame;\
    pVar->bToOutput = false;\
    pVar->pPrev     = NULL;\
    pVar->pNext     = NULL;\
    pVar->pFirstFrame = NULL;\
    pVar->pLastFrame  = NULL;\
    pVar->pFirstIFrame= NULL;\
    pVar->pLastIFrame= NULL;
```

2.4.5. APPEND

```
#define APPEND(pList, member, pItem, ItemName)
if(pList->member##pLast##ItemName)
    pList->member##pLast##ItemName->pNext = pItem;
else
    pList-> member##pFirst##ItemName=pItem;
pItem->pPrev = pList-> member##pLast##ItemName;
pItem->pNext = NULL;
pList->member##pLast##ItemName = pItem;

#define APPEND_M(pList, member, pItem, ItemName)\
if(pList->member##pLast##ItemName)\
    pList->member##pLast##ItemName->pNext = pItem;\
else\
    pList-> member##pFirst##ItemName=pItem;\
pItem->pPrev = pList-> member##pLast##ItemName;\
pItem->pNext = NULL;\
pList->member##pLast##ItemName = pItem;
```

2.4.5.1. APPEND_PAGE

```
#define APPEND_PAGE(this, pPage)\
APPEND_M(this, m_, pPage, Page)
```

2.4.5.2. APPEND_CARD

```
#define APPEND_CARD(pPage, pCard)\
APPEND(pPage, pCard, Card)
```

2.4.5.3. APPEND_ELEMENT

```
#define APPEND_ELEMENT(pChain, pElement)\
APPEND(pChain, pElement, Element)
```

2.4.5.4. APPEND_CHAIN

```
#define APPEND_CHAIN(pChain)\
APPEND_M(this, m_, pChain, Chain)
```

2.4.5.5. APPEND_CHAIN_TO_CARD

```
#define APPEND_CHAIN_TO_CARD(pCard, pChain)\
APPEND(pCard, pChain, Chain)
```

2.4.5.6. APPEND_DEL_CHAIN

```
#define APPEND_DEL_CHAIN(pChain)\
APPEND_M(this, m_, pChain, DelChain)
```

2.4.5.7. APPEND_ATTR

```
#define APPEND_ATTR(pElement, pAttr)\
APPEND(pElement, pAttr, Attr)
```

2.4.5.8. APPEND_UNIT

```
#define APPEND_UNIT(pCard, pUnit)
APPEND(pCard, pUnit, Unit);
```

2.4.5.9. APPEND_FAMILY

```
#define APPEND_FAMILY(pCard, pFamily)\
APPEND(pCard, pFamily, Family)
```

2.4.5.10. APPEND_UNIT_TO_FAMILY

```
#define APPEND_UNIT_TO_FAMILY(pCard, pUnit)\
bFamilyIsFound = false;\
for(pFamily = pCard->pFirstFamily; pFamily; pFamily = pFamily->pNext){\

    if(pFamily->iFamilyId == pUnit->pElement->Ele.iFamilyId){\
        APPEND(pFamily, pUnit, Unit);\
        bFamilyIsFound = true;\
        break;\
    }\
}\
if(bFamilyIsFound == false){\
    NEW_FAMILY(pFamily, pUnit);\
    APPEND_FAMILY(pCard, pFamily);\
    APPEND(pFamily, pUnit, Unit);\
}
```

2.4.6. STATEMENT

2.4.6.1. PUSH_STATEMENT

```
#define PUSH_STATEMENT(Stack, pStatement)\
if(Stack.pLastStatement)\
    Stack.pLastStatement->pNext = pStatement;\
else\
    Stack.pFirstStatement=pStatement;\
pStatement->pPrev = Stack.pLastStatement;\
pStatement->pNext = NULL;\
while(pStatement->pNext != NULL)\
    pStatement=pStatement->pNext;\
Stack.pLastStatement = pStatement;
```

2.4.6.2. POP_STATEMENT

```
#define POP_STATEMENT(Stack, pStatement)\
pStatement = Stack.pLastStatement;\
while(pStatement->bNewAction == false)\
    pStatement = pStatement->pPrev;\
Stack.pLastStatement = Stack.pLastStatement->pPrev;\
if(Stack.pLastStatement)\
    Stack.pLastStatement->pNext = NULL;\
else\
    Stack.pFirstStatement = NULL;
```

2.4.7. IS

2.4.7.1. IS_DESCENDANT

Decide whether Element Ele_2 is the descendant of Element Ele_1.

```
#define IS_DESCENDANT(Ele_1, Ele_2)\
    (Ele_1.iFamilyId == Ele_2.iFamilyId &&\
        Ele_1.sPath.substring(Ele_2.sPath)
```

2.4.7.2. IS_EQUAL

Decide whether Element Ele_2 equals Element Ele_1.

```
#define IS_EQUAL(Ele_1, Ele_2)\
    (Ele_1.iFamilyId == Ele_2.iFamilyId &&\
    Ele_1.sPath.equals(Ele_2.sPath))
```

2.4.8. INSERT

p1 and p2 are two pointers.

2.4.8.1. INSERT_BEFORE

Insert the structure instance pointed by p1 before the one pointed by p2.

```
#define INSERT_BEFORE(pFirst, p1, p2)
if(p2 == pFirst)\
    pFirst = p1;\
else\
    p2->pPrev->pNext= p1;\
\
p1->pPrev = p2->pPrev;\
p1->pNext=p2;\
p2->pPrev=p1;
```

2.4.8.2. INSERT_AFTER

Insert structure instance pointed by p2 after the one pointed by p1

```
#define INSERT_AFTER(pLast, p1, p2)
if(p1 == pLast)\
    pLast = p2;\
else\
    p1->pNext->pPrev= p2;\
p2->pNext = p1->pNext;\
p2->pPrev=p1;\
p1->pNext=p2;\
```

2.4.9. CUT

```
#define CUT(pFirst, pLast, pCurrent)\
if(pCurrent == pFirst){\
    pFirst = pCurrent->pNext;\
}\
else{\
    if(pCurrent == pLast){\
        pLast = pCurrent->pPrev;\
        pLast->pNext = NULL;\
    }\
    else{\
        pCurrent->pPrev->pNext = pCurrent->pNext;\
        pCurrent->pNext->pPrev = pCurrent->pPrev;\
    }\
}\
pCurrent->pPrev = pCurrent->pNext = NULL;
```

2.4.9.1. CUT_ELEMENT

```
#define CUT_ELEMENT(pFirst, pLast, pCurrent)\
    CUT(pFirst, pLast, pCurrent)\
    pCurrent->bIsChainBase = false;
```

2.4.10. REPLACE

```
#define REPLACE(pFirst, pLast, pOld, pNew)\
if(pOld == pLast){\
    pLast = pNew;\
}\
if(pOld == pFirst){\
    pFirst = pNew;\
}\
if(pOld->pPrev)\
    pOld->pPrev->pNext = pNew;\
if(pOld->pNext)\
    pOld->pNext->pPrev = pNew;\
pNew->pNext = pOld->pNext;\
pNew->pPrev = pOld->pPrev;\
pOld->pPrev = pOld->pNext = NULL;
```

2.5. Class Definition

Appendix B

```
class RuleGenerator{
private:
    Stack    m_redoStack;
    Stack    m_undoStack;
    Page     *m_pFirstPage;
    Page     *m_pLastPage;
    Chain    *m_pDelChain;
    Chain    *m_pFirstChain;
    Chain    *m_pLastChain;
    Chain    *m_pFirstDelChain;
    Chain    *m_pLastDelChain;
    bool m_bCanUndo, m_bCanRedo;
public:
    PageRule m_FirstRule;
private:

    void     DestroyElement(Element *pElement);
    Element  *DeleteElement(Chain *pChain, Element *pElement);
    void     LocateElement(Chain *pChain, ElementInfo *pElementInfo);
    void     NewChain(ElementInfo *pElementInfo, Statement *pStatement);
    Chain    *DeleteChain(Chain *pChain, Card *pCard=NULL, int
mode=FROM_NOWHERE);
    void     NewChildChain(Element *pParentElement, char cAction, Element
*pSourceElement);
    void     UpdateChain(ElementInfo *pElementInfo, Statement *pStatement);
    void     UpdateDelChain(TagId Ele, char cAction);
    void     FilterDelChain();
    void     AssemblyChain();
    void     ParseFrame(Chain *pChain, Page *pPage);
    void     OutputVar(ostream& xsltFile, Var *pVar, DOMString sFrom);
    void     OutputChain(ostream& xsltFile, Card *pCard, Chain *pChain);
    Element  *GetUnit(Card *pCard);

public:
    Statement();        //initialize the redo & undo stack(alloc memory for them)
    ~Statement();       //free the space

public:
    void PushStatement(char cAction, TagId sourceEle, TagId targetEle, bool bNewAction);
    void PushStatement(char cAction, TagId sourceEle, bool bNewAction);
    void PushStatement(TagId sourceEle, DOMString psNewAttrName[], DOMString
psNewAttrValue[], int iNumOfAttr, bool bNewAction);
    void PushStatement(TagId sourceEle, DOMString sNewText, bool bNewAction)
    void     UndoStatement();
    void     RedoStatement();
    bool     CanRedo();
    bool     CanUndo();
    void GenerateXSLT();
    char *SaveTempXSLT(int iPage, int iFrame);
    int ReloadXSLT(char *pszXsltFile, int iPage, int iFrame);
};
```